

Acotylea (Platyhelminthes, Polycladida) from the southern and western Iberian Peninsula, with the description of five new species

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Abstract

Most of the European polyclad species were described after material was collected from the Gulf of Naples, Italy, which was compiled in the renowned monograph of Arnold Lang in 1884. On the other hand, little is known about the diversity of flatworms in the Iberian Peninsula, with 49 recorded species, which are mainly registered in the northern coast of Spain. Moreover, polyclads in Portugal have never been studied before. In our study, specimens of 13 species of acotylean flatworms were collected from the southern and western Atlantic coasts of the Iberian Peninsula. All of the species included here are well documented with colour pictures and histological sections. The geographical distribution of the known species has been updated. Five of the collected species are new to science: *Stylochus erytheius* **sp. nov.**, *S. marimarensis* **sp. nov.**, *Plehnia cascaisensis* **sp. nov.**, *Izmira lusitanica* **sp. nov.**, and *Emprostopharynx onubensis* **sp. nov.**

Key Words

Anatomy, biodiversity, marine flatworms, Portugal, Spain

Introduction

The Iberian Peninsula has an exceptional geographic position and is well known for having a great variety of habitats and high species richness (Molina-Venegas et al. 2015). However, it has been estimated that the overall number of marine invertebrate species in this area is still unknown, especially considering the punctually studied taxa such as marine flatworms (Aguado et al. 2011). The Iberian Peninsula is a region of high interest for biodiversity due to the convergence of two different water masses (the Atlantic Ocean and Mediterranean Sea), the resulting environmental changes (Farina et al. 2003; Templado et

al. 2021), and the strategic location of the Strait of Gibraltar. These factors have led to the emergence of a hotspot for endemism and the migration of non-native species from other areas in the region.

In this context, a study of Polycladida (Rhabditophora, Platyhelminthes) from the southern coast of Spain and Portugal was conducted. Polycladida is a group of free-living worms with 1033 species described worldwide (Tyler et al. 2006–2024). They are almost exclusively marine and inhabit a wide range of environments, including seagrass meadows and sandy bottoms, as well as the deep sea (Quiroga et al. 2006, 2008; Oya and Kajihara 2018). Several scientific reports covering the

polyclads found in the Iberian Peninsula have been published in the last decade (Gammoudi and Tekaya 2012; Noreña et al. 2014, 2015; Marquina et al. 2014a, 2014b; Rodríguez et al. 2017; Pérez-García et al. 2019). These reports recorded 49 species of polyclads, which are mainly located on the northern coasts of Spain. In contrast, reports of marine flatworms on the coasts of Portugal are rare, except for reports of *Leptoplana tremellaris* (Müller OF, 1773) (Saldanha 1974) and some records by naturalists (e.g., iNaturalist [www.inaturalist.org]).

The main goal of this study is to provide a comprehensive geographical record of acotylean flatworms identified on the southern and western coasts of the Iberian Peninsula. In addition, we update the geographical distribution of the known species and improve taxonomical knowledge on these species within the coastal areas of the Iberian Peninsula.

Methods

Study area

The coastal geology of Cadiz and Algeciras is mainly composed of sedimentary rocks, which have been shaped by tectonic activity and erosion. On the other hand, Portugal's coast has a diverse geological history that includes sedimentary, igneous, and metamorphic rocks. These geological differences have an impact on the coastal morphology and substrate composition, leading to distinct landscapes. Cadiz and Algeciras have rugged coastlines characterised by rocky cliffs and sandy beaches, which are influenced by the nearby Strait of Gibraltar. Portugal's coastline has cliffs and sandy beaches as well, but it also has pronounced estuaries, lagoons, and tidal flats that provide unique habitats. The coast of this region is distinguished by its extensive seagrass meadows and salt marshes, which support a wide range of aquatic and bird species. However, both regions face environmental challenges such as coastal erosion, pollution, habitat loss, climate change, high population densities, land use patterns, and management strategies (Micallef and Rangel-Buitrago 2019; Morales 2022).

For this study, polyclads were collected at seventeen stations. Of these, sixteen are from the southern and southwestern Iberian Peninsula (Fig. 1, Table 1), and one from northern Portugal. These stations are located along the coasts of Algeciras, Cadiz, and Portugal and share some similar characteristics. However, they also have some unique differences, which are outlined in the descriptions of the different species. The numbers of the stations are referred to from north to south:

Station 1, Praia de Gondarém, Oporto (41°9'22.31"N, 8°40'53.70"W);

Station 2, Praia do Baleal, Peniche (39°22'21.1"N, 9°20'26.4"W);

Station 3, Cascais (38°40'59.32"N, 9°25'55.59"W);

Station 4, Área Marinha Protegida das Avenças, Parede (38°41'35"N, 9°22'03"W);

Station 5, Troia, Grândola (38°29'16.8"N, 8°53'18.1"W);

Station 6, Praia de Alpertuche, Arrabida (38°28'01.8"N, 8°59'25.1"W);

Station 7, Sagres (37°0'44.43"N, 8°55'47.29"W);

Station 8, Praia da Luz, Lagos (37°5'6.32"N, 8°43'6.23"W);

Station 9, Ria Formosa, Faro (37°0'30.40"N, 7°59'39.57"W);

Station 10, El Portil, Huelva (37°12'33.72"N, 7°3'17.50"W);

Station 11, La Caleta Beach, Cádiz (36°31'55.50"N, 6°18'26.45"W);

Station 12, Santa Maria del Mar Beach, Cádiz (36°31'18.53"N, 6°12'18.17"W);

Station 13, El Chato Beach, Cádiz (36°28'48.89"N, 6°15'57.79"W);

Station 14, Sancti Petri Beach, Chiclana (36°22'52.69"N, 6°12'18.17"W);

Station 15, Tarifa (36°0'42.59"N, 5°35'54.54"W);

Station 16, Punta Carnero, Algeciras (36°11'10.16"N, 6°15'56.65"W);

Station 17, La Ballenera Beach, Algeciras (36°5'17.81"N, 5°26'30.77"W).

The material was collected over a long period of time, extending from July 2013 to July 2019.

Most of the polyclads were found under rocks intertidally (0.1–0.8 m deep) and were removed from the rocky substrate by the application of a paintbrush. The flatworms were photographed in situ when possible. Most flatworms from Cádiz (Spain) and Algarve (Portugal) were found camouflaged through calcareous rodophytes, mainly *Ellisolandia elongata* (J. Ellis and Solander) K.R. Hind and G.W. Saunders 2013 and lush phaeophytes such as *Halopteris scoparia* (Linnaeus) Sauvageau or *Dictyota dichotoma* (Hudson) J.V. Lamouroux. Nevertheless, some species were observed on stones without benthic fauna or algae.

Morphological study and species identification

The specimens were observed under a stereoscope microscope in glass Petri dishes upon arrival at the laboratory. The specimens were anaesthetised with 7.5% magnesium chloride, measured in length, and then a piece of the lateral body was cut for further molecular analyses and stored in absolute ethanol. The relaxed flatworms were then immersed in Bouin's solution for 30 minutes, stretched for manipulation, and preserved in 70% ethanol (Newman and Cannon 2003).

Acotylean specimens were histologically processed to study their internal morphology after sectioning and staining with the Azan trichrome method (Romeis 1987). The relevant sections were photographed and used to reconstruct their internal anatomy.

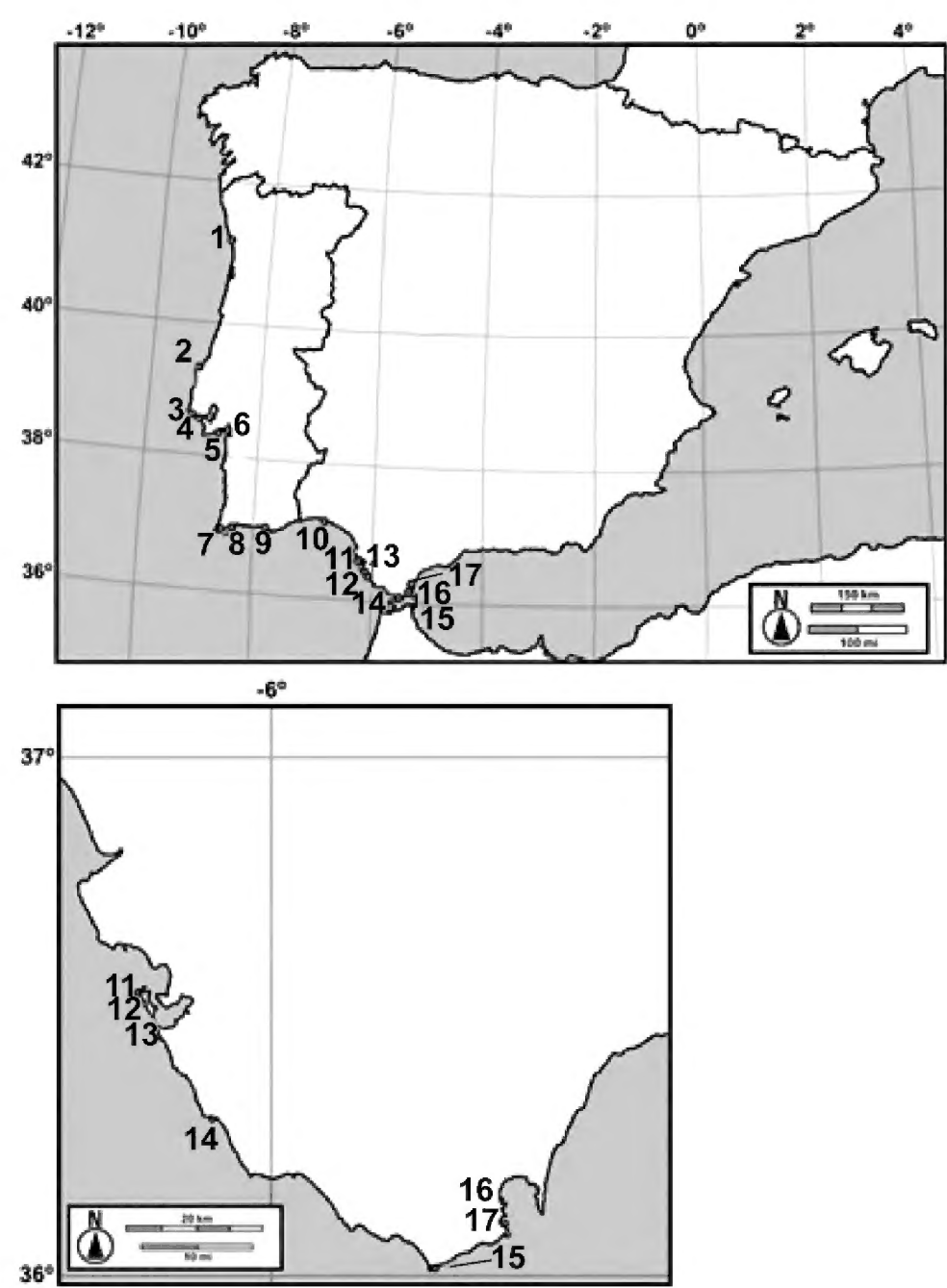


Figure 1. Map of the coasts of the Iberian Peninsula (top) and the province of Cadiz (bottom) showing the sampling locations studied.

Table 1. Species and number of specimens collected at each station. The grey cells correspond to sampling points from Portugal, and the white cells belong to Spain.

Species	Station 1	Station 2	Station 3	Station 4	Station 5	Station 6	Station 7	Station 8	Station 9	Station 10	Station 11	Station 12	Station 13	Station 14	Station 15	Station 16	Station 17	Total of specimens
<i>Stylochus neapolitanus</i> (Delle-Chiaje, 1841–1844)			1								1							2
<i>Stylochus mediterraneus</i> Galleni, 1976											5	1	1					7
<i>Stylochus erytheius</i> sp. nov.											4							4
<i>Stylochus marimarensis</i> sp. nov.												1						1
<i>Plehnia cascaisensis</i> sp. nov.			4															4
<i>Leptoplana mediterranea</i> Bock, 1913	10	3		5							3	4		1				26
<i>Parviplana jeronimoi</i> sp. nov.											3	1						4
<i>Echinoplana celerrima</i> Haswell, 1907							1				1	4						6
<i>Notoplana alcinoi</i> (Schmidt, 1861)											7	3						10
<i>Izmira lusitanica</i> sp. nov.				2														2
<i>Emprostopharynx onubensis</i> sp. nov.										1								1
<i>Comoplana agilis</i> (Lang, 1884)				1				2			5							8
<i>Phaenoplana caetaria</i> sp. nov.															1	4	5	10
<i>Discocelis tigrina</i> (Blanchard, 1847)				1	1	1		1	1	2	4							11
Total of specimens	1	1	2	4	1	1	1	2	1	2	10	6	1	1	1	1	1	96

Species were identified based on internal and external morphological characteristics. Body measurements were taken from live and fixed specimens as well as histological sections. In the description of the new species, the organ measurements refer to a single specimen, the holotype.

The specimens from Spain were deposited in the Invertebrate Collection of the Museo Nacional de Ciencias Naturales de Madrid (MNCN), Spain. The specimens from Portugal were deposited in the Invertebrate Collection of the Museu Nacional de História Natural e da Ciência of Lisbon (MNHNC), Portugal.

Results

A total of 96 specimens had been identified throughout this study. Their presence in each locality is shown in Table 1.

Systematic description

Suborder ACOTYLEA Lang, 1884

Superfamily STYLOCHOIDEA Poche, 1926

Family STYLOCHIDAE Stimpson, 1857

Genus *Stylochus* Ehrenberg, 1851

***Stylochus neapolitanus* Lang, 1884**

Fig. 2

Planaria neapolitana Delle Chiaje, 1841–1844.

Material examined. • MNCN 4.01/3281 to 3334, Station 11, 23 February 2015, 28 mm long, sagittally sectioned into 54 slides. All of the measurements from the description refer to this specimen.

The specimen from Station 3 was damaged during transport to the laboratory. However, it could be photographed in situ. This information has been added to the material as a comment.

Description. *Stylochus neapolitanus* from Cadiz agrees with the original description of the species by Lang 1884.

Body shape elongated, with pointed anterior and rounded posterior end, 28 mm long alive. Dorsal surface with dark brown background colour with scattered whitish and greenish spots (Fig. 2A), larger at the margins and smaller in the body centre. An orange band surrounds the margins. Ventral whitish (Fig. 2B). Nuchal tentacles conical, white, and with remarkable orange spots on the tips.

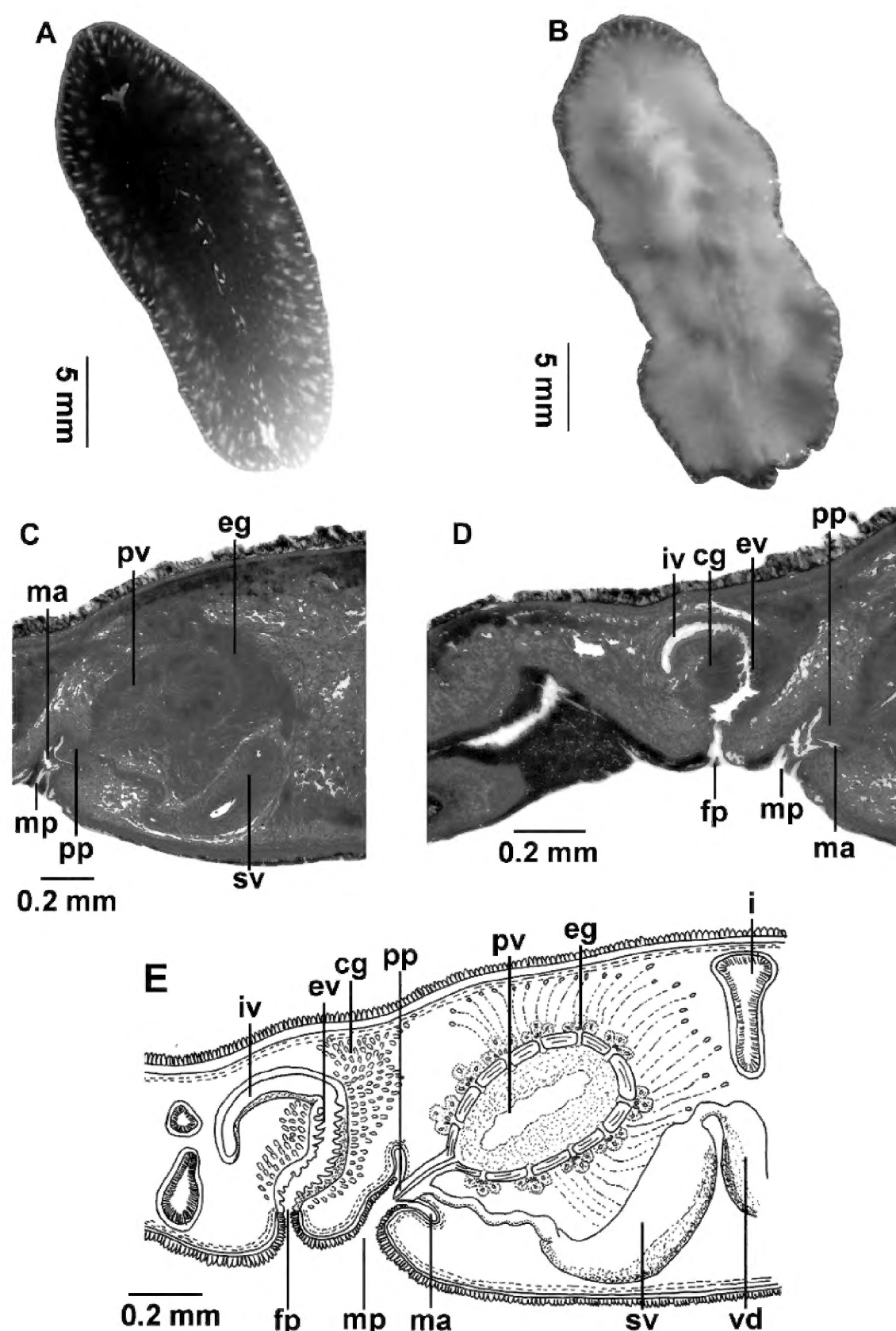


Figure 2. *Stylochus neapolitanus* (MNCN 4.01/3281 to 3334). Histological sections are postero-anteriorly oriented: **A.** Dorsal view of a living specimen; **B.** Ventral view; **C.** Histological section of the male copulatory organs; **D.** Histological section of the female apparatus; **E.** Sagittal reconstruction of the reproductive system. Abbreviations: cg, cemental glands; eg, extravascular glands; ev, external vagina; fp, female pore; i, intestine; iv, internal vagina; ma, male atrium; mp, male pore; pp, penis papilla; pv, prostatic vesicle; sv, seminal vesicle; vd, vas deferens.

Tentacular eyes at the base and on the tentacles. Cerebral eyes between tentacles. Marginal eyes present only in the anterior margin. Pharynx ruffled, with well-developed lateral branches (Fig. 2B). Oral pore at the centre of the pharynx. Male and female pores separated (0.2 mm) and located near the posterior end.

Reproductive system. Male copulatory apparatus with a true seminal vesicle, an oval prostatic vesicle, and a small penis papilla. Elongated seminal vesicle 0.7 mm in length. Free prostatic vesicle surrounded by extravascular glands. Short penis papilla housed in a small atrium. Sperm and prostatic ducts join medially. Female apparatus consists of a folded external vagina and a smooth internal vagina (Fig. 2D, E). Well-developed cement gland surrounds the external vagina. Internal vagina extends backwards, receiving the oviducts at the end. Lang's vesicle absent.

Biology. This species was found among samples of the alga *Dictyota dichotoma* (Phaeophyceae, Ochrophyta) collected from rocky substrates in intertidal areas. Previously, it was also collected in substrate covered by the green algae *Caulerpa prolifera* (Forsskal) J. V. Lamouroux 1809 (Chlorophyta, Caulerpaceae) (Marquina et al. 2014a) or on the bottom surface of barges and lamelli-branch empty shells (Noreña et al. 2015).

Distribution. *Stylochus neapolitanus* was recorded in Sicily, Naples (Lang 1884), Cape Verde (Laidlaw 1906), Senegal (Palombi 1939), Catalonia (Novell 2001, Murcia (Marquina et al. 2014a), Galicia (Noreña et al. 2015), and Sidi Ifni (Cuadrado et al. 2021). This is the first report of *S. neapolitanus* in Andalusia.

Stylochus mediterraneus Galleni, 1976

Fig. 3

Stylochus (Imogine) *mediterraneus* Galleni, 1976.

Imogine mediterranea (Galleni, 1976) Jennings & Newman, 1996.

Material examined. • MNCN 4.01/3448 to 3463, Station 11, 29 April 2014, 14 mm long, sagittal sectioned into 16 slides; • MNCN 4.01/3521 to 3560, Station 11, 19 April 2015, 30 mm long, sagittal sectioned into 40 slides (all the measurements from the description refer to this last specimen); • MNCN 4.01/3957, Station 11, 30 November 2017, 12 mm long; • MNCN 4.01/3959, Station 11, 19 May 2016, 32 mm long; • MNCN 4.01/3960, Station 11, 2 February 2018, 28 mm long; • MNCN 4.01/3561 to 3630, Station 12, 2 March 2014, live and fixed specimen, no histological processed; Station 13, 15 June 2015, 42 mm long, sagittal sectioned into 70 slides.

Description. Thick worm with oval shape and variable length, 42 mm long (26.33 ± 11.41 mm). Dorsal side brownish with brown pale spots scattered along the whole surface (Fig. 3A). A few dark spots are also present, more numerous in the body margin. Margins white, with dark spots. Ventral side pale or cream (Fig. 3B). Nuchal retractile tentacles present. Tentacular eyes present at the base and on the tips of the tentacles (Fig. 3C). Cerebral eyes arranged in two

clusters between the tentacles. Frontal eyes present, scattering to the anterior margin. Marginal eyes around the entire body edge. Pharynx ruffled, anterior located with numerous lateral branches (Fig. 3B). Oral pore anteriorly positioned in the central part of the pharynx. Gonopores separated but close together (0.2 mm), located in the last third of the body.

Reproductive system. Male system with spermiducal bulbs, anchor-shaped seminal vesicle, polyglandular prostatic vesicle, and short penis papilla (Fig. 3G). Spermiducal bulbs enter separately into the tripartite seminal vesicle. Seminal vesicle horizontal (Fig. 3D), located just behind the prostatic vesicle. Prostatic vesicle elongated (0.74 mm long), with a well-developed muscular wall (0.05 mm) and crossed by numerous extravascular glands (Fig. 3E, G). In the middle section, the prostatic and seminal ducts together form the ejaculatory duct (Fig. 3G). Penis papilla short-housed in a ciliated male atrium (Fig. 3E).

Female pore close to the male pore, leading to a slightly folded external vagina (Fig. 3F, G). Distal part of the external vagina internally folded (Fig. 3F, G). Smooth internal vagina, in which the paired oviducts are received. Lang's vesicle absent.

Remarks. The features of the specimens studied herein match Galleni's (1976) description for specimens found on the Tuscany coast (Italy), except for the structure of the female complex, in which the presence of folds within the vagina externa is not mentioned. However, Gammoudi et al. (2009) also noted the horizontal orientation of the penis papilla, the ciliated or non-ciliated atrium, and the dilations in the external vagina in specimens from Tunisia and not for the populations from Tuscany (Galleni 1976).

Biology. The specimens were observed under rocks in the intertidal zone and among brown algae *Halopteris scoparia* (Ochrophyta). In other studies, this species and its egg masses were found in cultures of *Mytilus galloprovincialis* (Mollusca, Bivalvia) (Gammoudi et al. 2009).

Distribution. This species was reported in several localities of the Mediterranean Sea, such as Croatia (Bytinski-Salz 1935, as *Stylochus pilidium*); Livorno, Marina di Pisa, and Punta Bianca, Italy (Galleni 1976); Liguria, Italy (Wenzel et al. 1992); Temara, Morocco, the Atlantic Ocean (Prudhoe 1989); Tunisia (Gammoudi et al. 2009); and Murcia (Marquina et al. 2014a). Our record is the first for this species on the Atlantic coasts of the Iberian Peninsula and in Andalusia.

Stylochus erytheius sp. nov.

<https://zoobank.org/9D19D6CC-7155-41D6-B6DB-39EE6E52F479>

Fig. 4

Holotype. • MNCN 4.01/3059 to 3113 and 4336 to 4535, Station 11, 9 October 2014, 71 mm long, sagittal sectioned into 254 slides.

Additional material. • MNCN 4.01/3962, Station 11, 20 April 2015, 35 mm long; • MNCN 4.01/3964, Station 11, 20 April 2015, 37 mm long; • MNCN 4.01/3966, Station 11, 2 February 2018, 120 mm long.

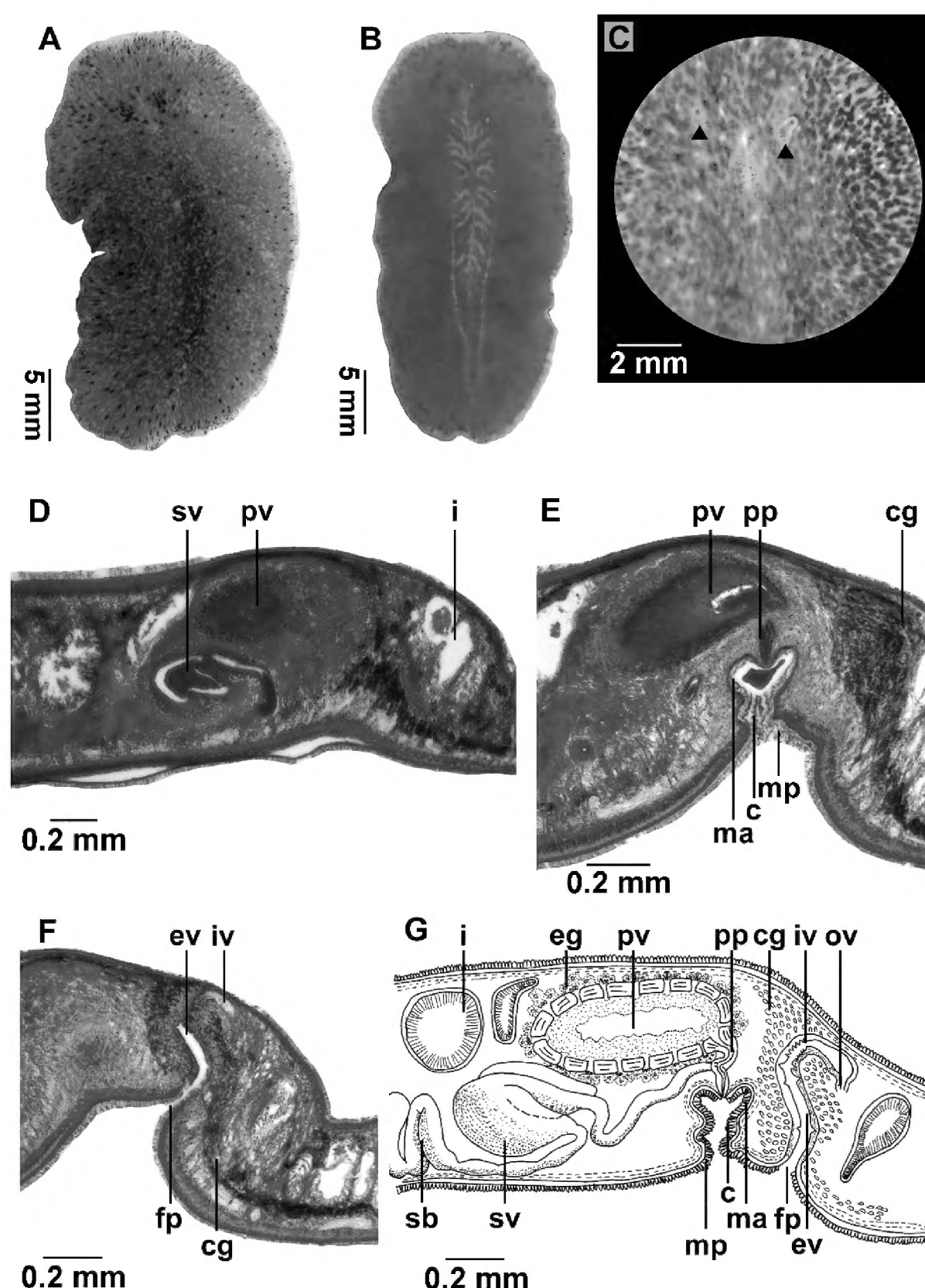


Figure 3. *Stylochus mediterraneus* (MNCN 4.01/3521 to 3560). Histological sections are antero-posteriorly oriented: **A.** Dorsal view of a living specimen; **B.** Ventral view; **C.** Detail of the tentacles and cerebral eyes; **D.** Histological section of the seminal vesicle and part of the prostatic vesicle; **E.** Histological section of the male copulatory organs; **F.** Histological section of the female apparatus; **G.** Sagittal reconstruction of the reproductive system. Abbreviations: c, cilia; cg, cemental glands; eg, extravascular glands; ev, external vagina; fp, female pore; i, intestine; iv, internal vagina; ma, male atrium; mp, male pore; ov, oviduct; pp, penis papilla; pv, prostatic vesicle; sb, spermiducal bulbs; sv, seminal vesicle.

Diagnosis. Body shape is oval with rounded anterior and posterior ends. Orange-brown dorsal background; numerous dark brown and whitish dots scattered on the dorsal surface; visible line of white dots along the main body axis; ventral surface pale orange; gonopores well-separated; with spermiducal bulbs; opening of the sperm duct distally located; penis papilla short.

Description. Oval-shaped Stylochidae, with rounded anterior and posterior ends, fleshy, 71 mm in length (65.75 ± 39.76 mm) and 63 mm in width. Margins mostly smooth. Background colouration orange-brown, with multiple dark brown and white dots on the dorsal surface (as shown in Fig. 4A). Additionally, a conspicuous line of white dots extends along the central axis of the body. Ventrally pale orange (Fig. 4B). Nuchal conical tentacles transparent, with tentacular eyes at the base and tips (Fig.

4C). Poorly visible cerebral eyes in two scattered clusters between the tentacles. Marginal eyes along the entire body margin. Pharynx ruffled centrally. Oral pore at the centre of the pharynx. Reddish, conspicuous gonopores well-separated (0.6 mm) posteriorly located.

Reproductive system. Male copulatory apparatus comprises spermiducal bulbs, a tripartite seminal vesicle, and a free prostatic vesicle (Fig. 4F). Spermiducal bulbs broad, run ventrally, and then posteriorly, turning dorsally before entering the seminal vesicle. Tripartite seminal vesicle anchor-like shape (Fig. 4D, F), well developed. Prostatic vesicle, large and oval-shaped (1.5 mm long), belongs to the polyglandular (“*djiboutiensis*”) type (Faubel 1983). Muscular wall crossed by numerous extravascular glands. The prostatic duct and the seminal duct join to form the short ejaculatory duct just before entering the

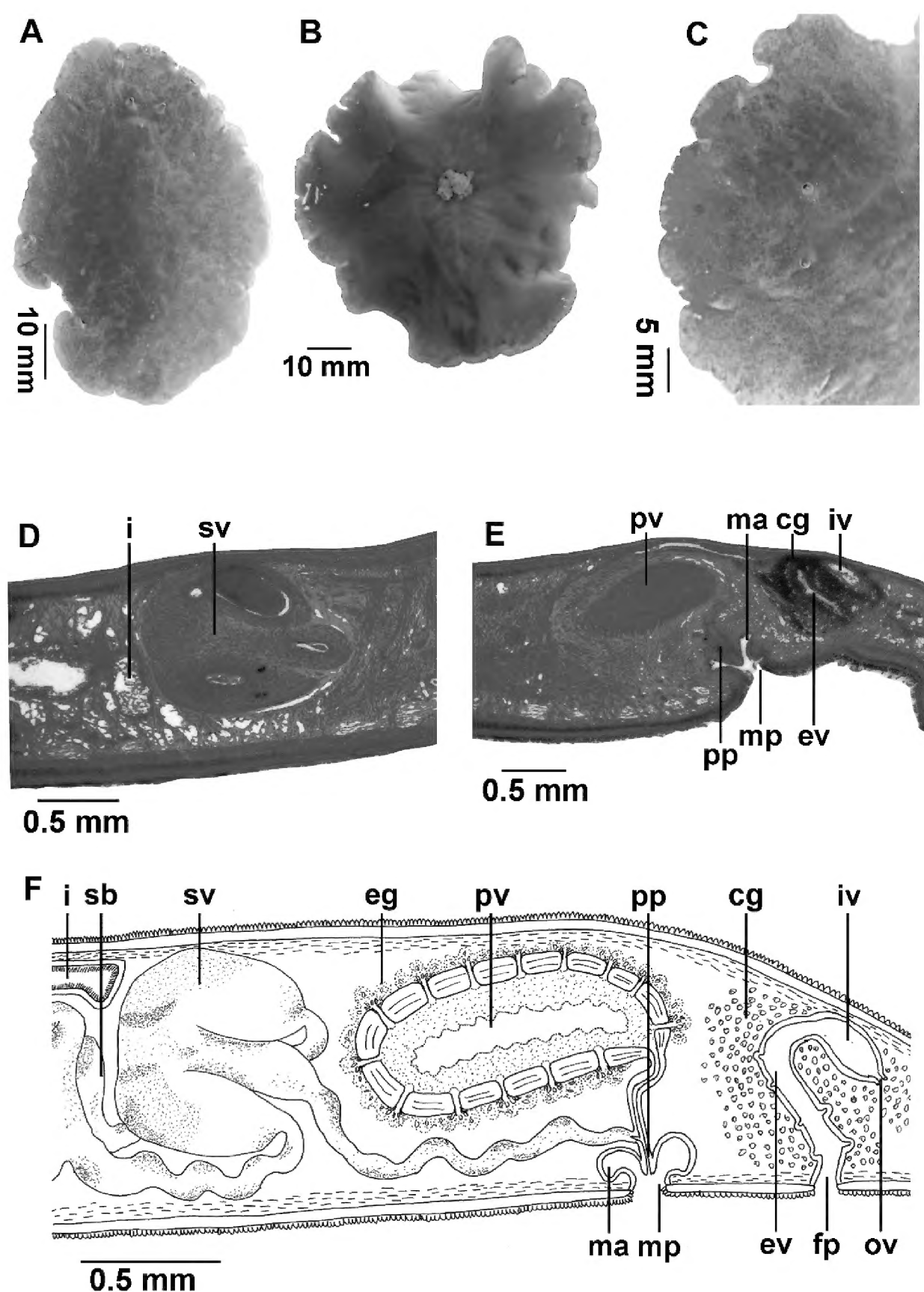


Figure 4. *Stylochus erytheius* sp. nov. (MNCN 4.01/3059 to 3113 and 4336 to 4535). Histological sections are antero-posteriorly oriented: **A.** Dorsal view of a living specimen; **B.** Ventral view; **C.** Detail of the tentacles and cerebral eyes; **D.** Histological section of the seminal vesicle; **E.** Histological section of the male and female copulatory organs; **F.** Sagittal reconstruction of the reproductive system. Abbreviations: cg, cemental glands; eg, extravesicular glands; ev, external vagina; fp, female pore; i, intestine; iv, internal vagina; ma, male atrium; mp, male pore; ov, oviduct; pp, penis papilla; pv, prostatic vesicle; sb, spermiducal bulbs; sv, seminal vesicle.

penis papilla. Penis papilla elongated (0.21 mm), opening into a sinuous male atrium (Fig. 4E).

The female copulatory apparatus simple and inconspicuous, formed by the vagina externa and interna. Without Lang's vesicle. The oviducts open together into the posterior region of the vagina interna. Abundant shell and cement glands open into the vagina externa and distal region of the vagina interna.

Type locality. La Caleta Beach, Cadiz, Spain.

Etymology. Named after Erytheia, a small island where the Phoenicians settled approximately 1100 BC. This area is where the beach of La Caleta is located, the type locality of the new species.

Remarks. A discussion of this species is included together with *S. marimarensis* sp. nov.

Biology. Specimens were collected from rocky substrates under stones in the intertidal zone.

Distribution. This species has only been found in La Caleta, Cadiz, Spain.

Stylochus marimarensis sp. nov.

<https://zoobank.org/2A320C66-4963-4B70-A7E6-E7E11C60625F>

Fig. 5

Holotype. • MNCN 4.01/2820 to 3058, Station 12, 2 March 2014, 55 mm long, sagittally sectioned into 237 slides.

Diagnosis. Oval-shaped worm with flattened anterior and tapered posterior ends. Pinkish colouration and pale pink spots scattered on the dorsal surface; black spots dis-

persed along the margins and at the base of the tentacles; margins whitish; ventral body pale pink; gonopores separated in last body third; with spermiducal bulbs; opening of the ejaculatory duct medially within the penis papilla; penis papilla elongated; male and female atrium ciliated.

Description. Oval shaped Stylochidae with flattened anterior and tapered posterior ends. Firm corporal thickness. Dorsal pigmentation pinkish, with scattered pale pink spots (Fig. 5A). Whitish margins with some folds and black mottling. Ventral surface pale pink (Fig. 5B). Transparent, conical nuchal tentacles (Fig. 5C) on either side of the cerebral lobes. Tentacular eyes situated at the base and tips of the tentacles. Two elongated clusters of cerebral eyes between the tentacles. Marginal eyes along the body margin, more numerous anteriorly. Pharynx ruffled along central body region. Oral pore medial. Gonopores separated (0.82 mm), reddish pigmented, and near the posterior end.

Reproductive system. Male system with an anchor-shaped seminal vesicle, a polyglandular prostatic vesicle (“*djiboutiensis*” type), and an elongated penis papilla (Fig. 5F). Spermiducal bulbs well-developed (Fig. 5D). Seminal vesicle tripartite (0.55 mm length, 0.65 mm width). Prostatic vesicle elongated, oval-shaped (1 mm long), surrounded by numerous extraventricular glands. Penis papilla elongated (0.22 mm) opening in a ciliated atrium. Seminal and prostatic ducts join medially to form the ejaculatory duct (Fig. 5F).

The female reproductive system is a simple tube divided into the external and internal vagina. Without Lang’s vesicle. The oviducts open together in the proximal region of the internal vagina. Abundant shell and cement glands empty into both vaginas. Female atrium shallow and ciliated.

Type locality. Santa Maria del Mar Beach, Cadiz (Spain).

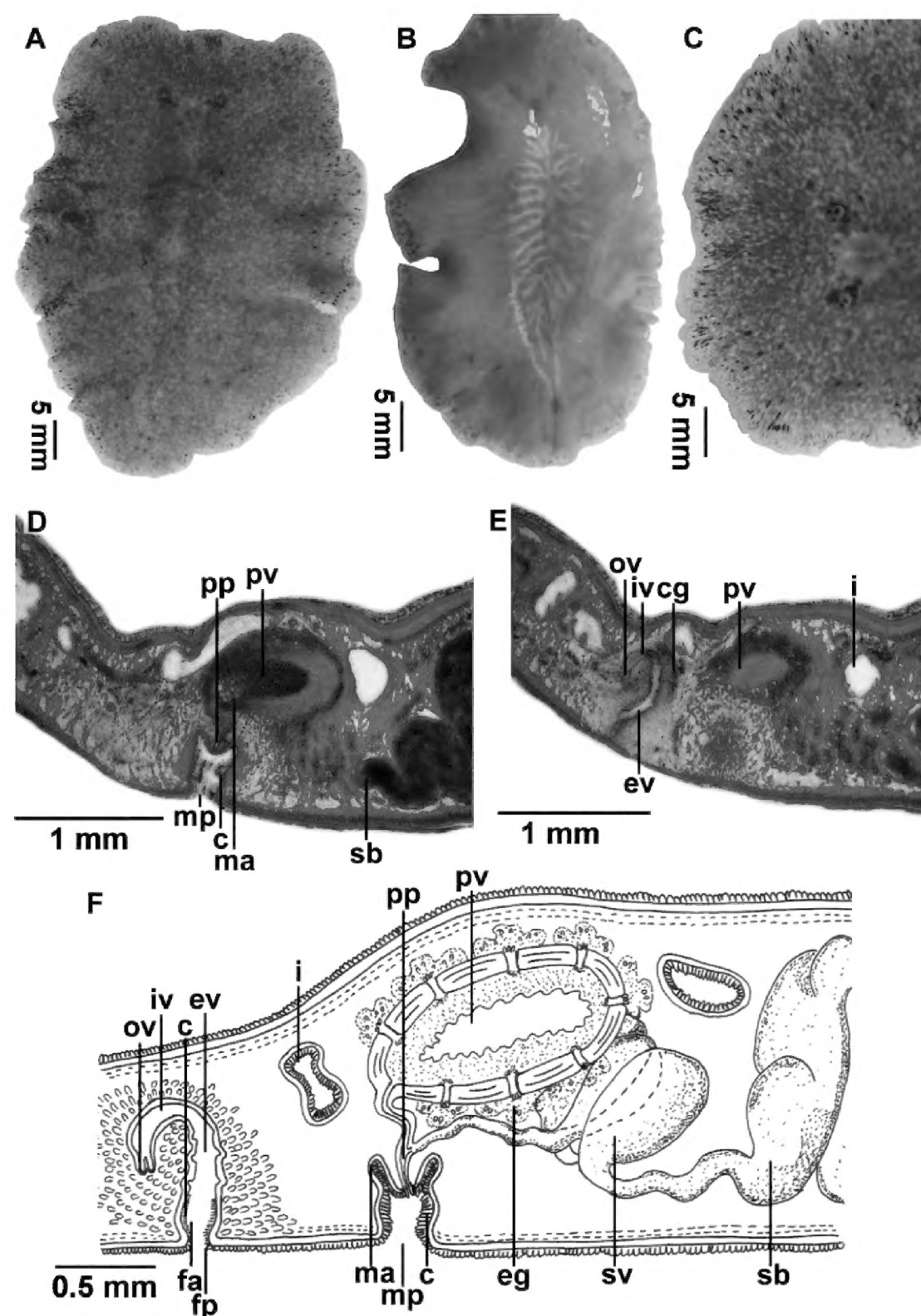


Figure 5. *Stylochus marimarensis* sp. nov. (MNCN 4.01/2820 to 3058). Histological sections are postero-anteriorly oriented: **A.** Dorsal view of a living specimen; **B.** Ventral view; **C.** Detail of the tentacles and cerebral eyes; **D.** Histological section of the male copulatory apparatus; **E.** Histological section of the female copulatory organs; **F.** Sagittal reconstruction of the reproductive system. Abbreviations: c, cilia; cg, cement glands; eg, extraventricular glands; ev, external vagina; fa, female atrium; fp, female pore; i, intestine; iv, internal vagina; ma, male atrium; mp, male pore; ov, oviduct; pp, penis papilla; pv, prostatic vesicle; sb, spermiducal bulbs; sv, seminal vesicle.

Etymology. The name of the new species refers to the type locality, Santa María del Mar.

Biology. Collected under rocks in the intertidal zone. The species was found on a stony bottom interspersed with rocky pools.

Distribution. The only locality where this species was collected is Santa Maria del Mar Beach, Cadiz (Spain).

General discussion of the newly described species of *Stylochus*. Sixty-two accepted *Stylochus* species are distributed worldwide (Tyler et al. 2006–2024) and are distinguished mainly by their colour pattern, eye arrangement, and colour and shape of the tentacles (Jennings and Newman 1996; Bulnes 2010). Nevertheless, additional features allow distinction among these species, such as the opening of the gonopores, together or separately, the junction of the seminal duct with the prostatic duct in the penis papilla, the shape and size of the penis papilla, and the inner outline of the external vagina. All of these characteristics are compared in Table 2 for *Stylochus* spp. distributed in the eastern Atlantic, Mediterranean, and Black Seas.

Stylochus marimarensis sp. nov. differs from other known species of the genus by its pinkish pigmentation with pale pink spots on the dorsal side, bordering whitish

margins, and black mottling. The known species in the Mediterranean and eastern Atlantic vary in colour from brown, orange, and white to yellow, but none of them display a continuous white edge, as in *S. marimarensis* sp. nov.

Stylochus spp. distributed out of these territories that share similar pigmentation with *S. marimarensis* sp. nov. are *S. qeshmensis* Maghsoudlou & Momtazi, 2014 and *S. kima*e Jennings & Newman, 1996. *S. qeshmensis* has a rosy brown colour with dark brown spots scattering dorsally except along the margins, white tentacles, and a short penis papilla. Black spots of *S. marimarensis* sp. nov. are distributed within the margins only, and few of them are under the tentacles. This latter presents transparent tentacles and long penis papilla. *S. kima*e has a bright orange-pink colour and several light brown dots, features which are lacking in *S. marimarensis* sp. nov. Both *S. qeshmensis* and *S. kima*e lack spermiducal bulbs, a very prominent character in *S. marimarensis* sp. nov.

Stylochus erytheius sp. nov. has remarkable orange, dark pigmentation and lacks a whitish margin. *S. fafai* also shares an orange colour, displays close but separated gonopores, a reduced penis papilla, and a female system without dilatations. The mottling of *S. mediterraneus* is

Table 2. Comparison among *Stylochus* spp. from the Eastern Atlantic, Mediterranean Sea, and Black Sea.

Species name	Dorsal colour	Junction of the prostatic and seminal ducts	Length of the penis papilla	Distal dilatation of the external vagina	Distribution	References
<i>Stylochus alexandrinus</i> Steinbock, 1937	Not described	Proximal	Short	Without dilatations	Egypt, Italy and Morocco (Atlantic)	Steinböck (1937); Galleni (1976); Prudhoe (1989); Bulnes et al. (2005);
<i>Stylochus erytheius</i> sp. nov.	Orange-brown with dark brown spots and scattered whitish dots	Distal	Long	With dilatations	Spain (Atlantic)	This study
<i>Stylochus fafai</i> (Marquina, Fernandez-Alvarez & Noreña, 2014)	Bright orange with small dark spots	Medial	Short	Without dilatations	Spain (Atlantic)	Marquina et al. (2014b)
<i>Stylochus marimarensis</i> sp. nov.	Pinkish with pale pink spots scattered. Margins whitish with black mottling	Medial	Long	With dilatations	Spain (Atlantic)	This study
<i>Stylochus mediterraneus</i> Galleni, 1976	Brownish with dark brown spots except in the mid-body. A white band is present along the margins	Medial/Distal	Short	With dilatations	Italy, Tunisia, Morocco (Atlantic)	Wenzel et al. (1992); Galleni (1976); Gammoudi et al. (2009); Prudhoe (1989)
<i>Stylochus melihertani</i> (Bulnes, 2010)	Orange-brownish with brownish speckles	Medial	Long	With dilatations	Türkiye	Bulnes (2010)
<i>Stylochus neapolitanus</i> (Delle Chiaje, 1841-1844)	Dark brown background colour interspersed by whitish and greenish mottling. Orange band in the margins	Proximal	Short	Without dilatations	Cape Verde, Italy, Senegal, Spain (Atlantic)	Laidlaw (1903); Bulnes et al. (2005); Palombi (1939); Noreña et al. (2015)
<i>Stylochus pilidium</i> (Goette, 1881)	Pale yellow, with dark and white mottling	Proximal	Short	Without dilatations	Italy, Spain (Mediterranean)	Goette (1881); Marquina et al. (2014a)
<i>Stylochus plessisii</i> Lang, 1884	Greyish-white, with brown spots on the dorsal side and a bold white marginal band interrupted by orange spots	Proximal	Short	Without dilatations	Italy	Lang (1884)
<i>Stylochus stellae</i> (Marquina et al., 2014)	Brownish with dark brown spots	Proximal	Long	Triangular dilatations	Spain (Mediterranean)	Marquina et al. (2014a)
<i>Stylochus tauricus</i> Jacubowa, 1909	Dark yellow with brown margins before the clear borders	Proximal	Short	Without dilatations	Black Sea, Ukraine	Jacubowa (1909)
<i>Stylochus vesiculatus</i> Jacubowa, 1909	Dirty yellow, with dark spots	Proximal	Short	Without dilatations	Black Sea, Ukraine	Jacubowa (1909)

darker than that of *S. marimarensis* sp. nov., and the latter has a more elongated penis papilla than the one observed in *S. mediterraneus*. *S. neapolitanus* presents a bold orange band in the margins, a dark brown background and greenish mottling on the dorsal side, and a reduced penis papilla. All of these features differ from those of the new species. The same occurs with *S. plessisii* since the colour pattern is different, with a whitish colour and black and orange spots. *S. pilidium* bears a yellowish, pale colour and a reduced penis papilla. Finally, *S. stellae* has a brown colour with dark brown spots, with separated gonopores close to each other and a proximal junction of the prostatic and seminal ducts, while *S. marimarensis* sp. nov. displays well-separated gonopores and a medial junction of the ducts.

On the other hand, the species that most resemble *S. erytheius* sp. nov. are *S. fafai* and *S. pilidium*. *S. fafai* shows a similar body shape and pigmentation, but the gonopores are located close together, the penis papilla is reduced, and the external vagina lacks dilatation. The background colour of *S. pilidium* is quite different, showing pale-yellow pigmentation, and the junction of the prostatic and seminal ducts is proximally located; the penis papilla is shorter than that observed in *S. erytheius* sp. nov., and the external vagina lacks dilatation.

Other species that share some similarities with *S. erytheius* are *S. kima* and *S. rutilis* Yeri and Kaburaki 1918. The most pronounced differences between *S. kima* and *S. erytheius* are the dorsal pigmentation. This one is brighter and pinkish with light brown mottling in *S. kima* and orangish with darker brown mottling and white dots in *S. erytheius* sp. nov. Additionally, the junction between the seminal and prostatic ducts occurs proximally in *S. kima* and distally in *S. erytheius* sp. nov. Conversely, *S. rutilis* displays a reddish orange dorsal colour, with also reddish spots and a red median line. This type of pattern is lacking in *S. erytheius* sp. nov. The marginal eyes are distributed along the anterior margins of *S. rutilis* but encircle the entire body of *S. erytheius* sp. nov. Finally, the gonopores are very close together in *S. rutilis* but distinctly separated in *S. erytheius* sp. nov.

Family PLEHNIIDAE Bock, 1913

Genus *Plehnia* Bock, 1913

Plehnia cascaisensis sp. nov.

<https://zoobank.org/21A8A353-8C24-4D6D-AC33-CE4F1C7142B8>

Figs 6, 7

Holotype. • MNHNC MB16-000107, Station 3, 29 May 2015 at 28 m depth, 9 mm long fixed, sagittal sectioned into 8 slides.

Additional material. • MNHNC MB16-000108, Station 3, 26 May 2015, at 9.1 m depth, 4 mm long, fixed, and sagittally sectioned into 3 slides. • MNHNC MB16-000109, Station 3, 28 May 2015 at 24 m depth, 6 mm long fixed. • MNHNC MB16-000110, Station 3, 28 May 2015 at 24 m depth, 6 mm long fixed.

Diagnosis. Plehniidae with a yellowish-brown background colour and multiple brown spots scattered on the

dorsal surface; pale yellow ventral body; well-separated gonopores; penis papilla characterised by a cap-shaped connective tissue; wide external vagina; and very long internal vagina.

Description. Plehniidae with fleshy and elongated body shape, rounded anteriorly and posteriorly, with high thickness. Length of voucher specimens varies between 4 and 6 mm fixed (average of 6.25 ± 2.06 mm). Ground colouration yellowish-brown with numerous brown spots scattered across the dorsal surface (see Fig. 6A, B). Ventral side pale yellow. Nuchal tentacles present (Fig. 6D). Tentacular eyes arranged in two clusters, located just under the tentacles. Small cerebral eyes in two clusters, extending from the tentacle to the anterior margin (Fig. 6C). Frontal eyes scattered at the anterior body margin. Ruffled pharynx positioned between the second and third regions. Genital pores separated and posterior to the pharyngeal pocket. Ovaries dorsal to the testes.

Reproductive system. Male reproductive complex directed backwards, composed of two spermiducal vesicles, a free prostatic vesicle, and an unarmed penis papilla (Fig. 6E). Vas deferens run ventrally under the vagina and turn backwards once reached the pharynx. Vas deferens expand and distally form spermiducal vesicles. Spermiducal vesicles reach the prostatic vesicle separately and medially (Fig. 7C). Prostatic vesicle large and pear-shaped (0.27 mm high and 0.32 mm wide) with a smooth glandular lining and strong muscular wall (0.12 mm thick). Numerous prostatic glands. Distally, a short penis papilla (0.1 mm long) is housed in a shallow male atrium. Penis papilla surrounded by cap-shaped connective tissue.

Female reproductive systems were large and completely developed in the studied animals (Figs 6F, 7A–C). Wide external vagina (0.08 mm), but not bulbous (Fig. 6F). Narrow, tube-like internal vagina ending in Lang's vesicle. Lang's vesicle is small (Fig. 7B) and oval-shaped (0.07 mm wide). The oviducts open in the distal region of the internal vagina.

Type locality. Cascais, Portugal.

Etymology. The specific name is dedicated to Cascais, the area where the holotype was collected.

Remarks. The presence of a separate opening of the vas deferens into the neck of the prostatic vesicle, the smooth glandular lining, the absence of a seminal vesicle, the long female vagina, and the presence of a well-developed Lang's vesicle allow the inclusion of the specimens in the genus *Plehnia*. *Plehnia* comprises four recognised species: *Plehnia arctica* (Plehn, 1896), *P. ellipsoides* (Girard in Stimpson, 1854), *P. caeca* Hyman, 1953, and *P. ovatus* Kato, 1937.

As shown in Table 3, *Plehnia arctica* and *P. cascaisensis* sp. nov. share only the position of the pharynx. However, many characteristics of *P. arctica* remain unclear due to its insufficient description. Notably, there are differences in size; *P. arctica* is larger and lacks nuchal tentacles, whereas *P. cascaisensis* sp. nov. is smaller and possesses tentacles.

On the other hand, the new species exhibits certain similarities with *P. ellipsoides* (see Table 3), including the

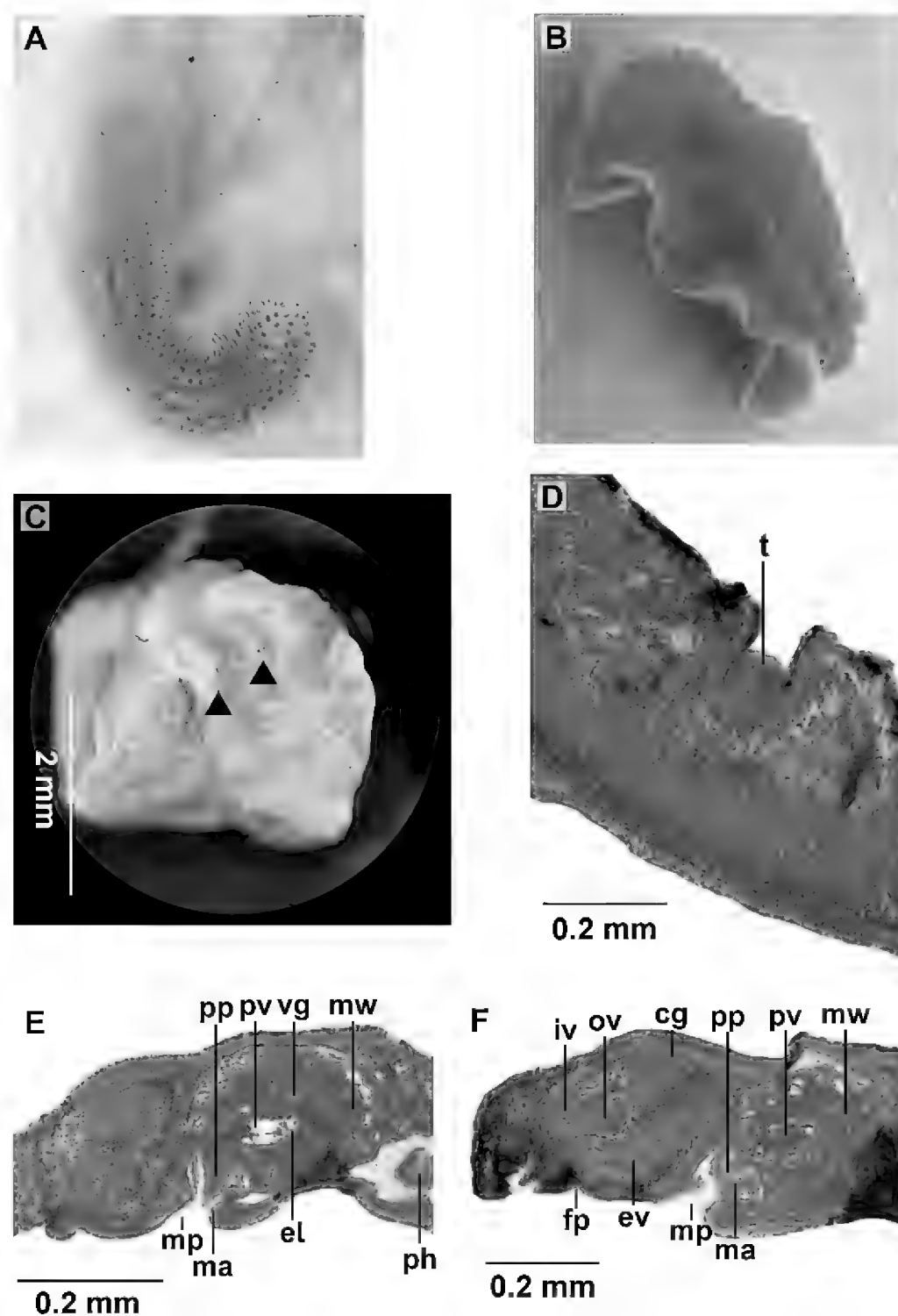


Figure 6. *Plehnia cascaisensis* sp. nov. Histological sections are postero-anteriorly oriented: **A.** Dorsal view of a living specimen (holotype, MNHNC MB16-000107); **B.** Dorsal view of a living specimen (additional material, MB16-000108); **C.** Detail of the eyes (additional material); **D.** Histological section of the tentacle (holotype); **E.** Histological section of the male copulatory organs (holotype); **F.** Histological section of the male and female organs (holotype). Abbreviations: cg, cemental glands; el, epithelial lining; ev, external vagina; fp, female pore; iv, internal vagina; ma, male atrium; mp, male pore; mw, muscular wall; ov, oviduct; ph, pharynx; pp, penis papilla; pv, prostatic vesicle; t, tentacle; vg, vesicular glands.

presence of tentacular, cerebral, and marginal eyespots, as well as similar background colouration. Substantial differences emerge, such as the absence of tentacles in *P. ellipsoides* and the position of the spermiducal vesicles' opening into the prostatic vesicle, which is distally positioned in *P. ellipsoides* and medially positioned in *P. cascaisensis* sp. nov. Additionally, differences in the female reproductive system exist; *P. ellipsoides* has a strong external vagina and an elongated Lang's vesicle, whereas the new species from Cascais has a wide external vagina and a small, rounded Lang's vesicle.

P. cascaisensis sp. nov. and *P. ovatus* are the only *Plehnia* species that share the presence of tentacles and the position of the opening of the spermiducal vesicles into the prostatic vesicle (see Table 3). Nonetheless, *P. ovatus* is smaller and possesses an oval body shape, resembling that of *Stylochidae* species (see fig. 4 in Kato 1937). In contrast, *P. cascaisensis* sp. nov. is elongated and narrower (Fig. 6A). The dorsal pigmentation also differs, with *P. ovatus* being darkish brown and *P. cascaisensis* sp. nov. being yellowish brown, displaying a spotted pattern. In *P. ovatus*, the prostatic ves-

icle is elongated, and the penis papilla opens into a large male atrium lined with ciliated cells. In *P. cascaisensis*, the vesicles are rounder and wider, and the penis papilla is contained within a shallow male atrium. The Lang's vesicle in the Japanese species is larger than that in the Iberian species.

P. caeca and *P. cascaisensis* differ externally and within the reproductive system, mainly in the female system. *P. caeca* lacks eyes and tentacles and has an elongated and less muscular prostatic vesicle. *P. caeca* also lacks a Lang's vesicle, and the oviducts empty into the proximal region of the internal vagina. In contrast, *P. cascaisensis* has a well-developed Lang vesicle and oviducts that empty into the distal region of the internal vagina.

All of these differences, as well as the unique characteristics of *P. cascaisensis* sp. nov., such as its spotted dorsal pattern, wide external vagina, and long internal vagina, led us to consider the specimens from Cascais as a distinct species.

Biology. collected in a rocky area covered by a reef of *Sabellaria* Lamarck 1818 (Annelida, Polychaeta).

Distribution. only known from Cascais, Portugal.

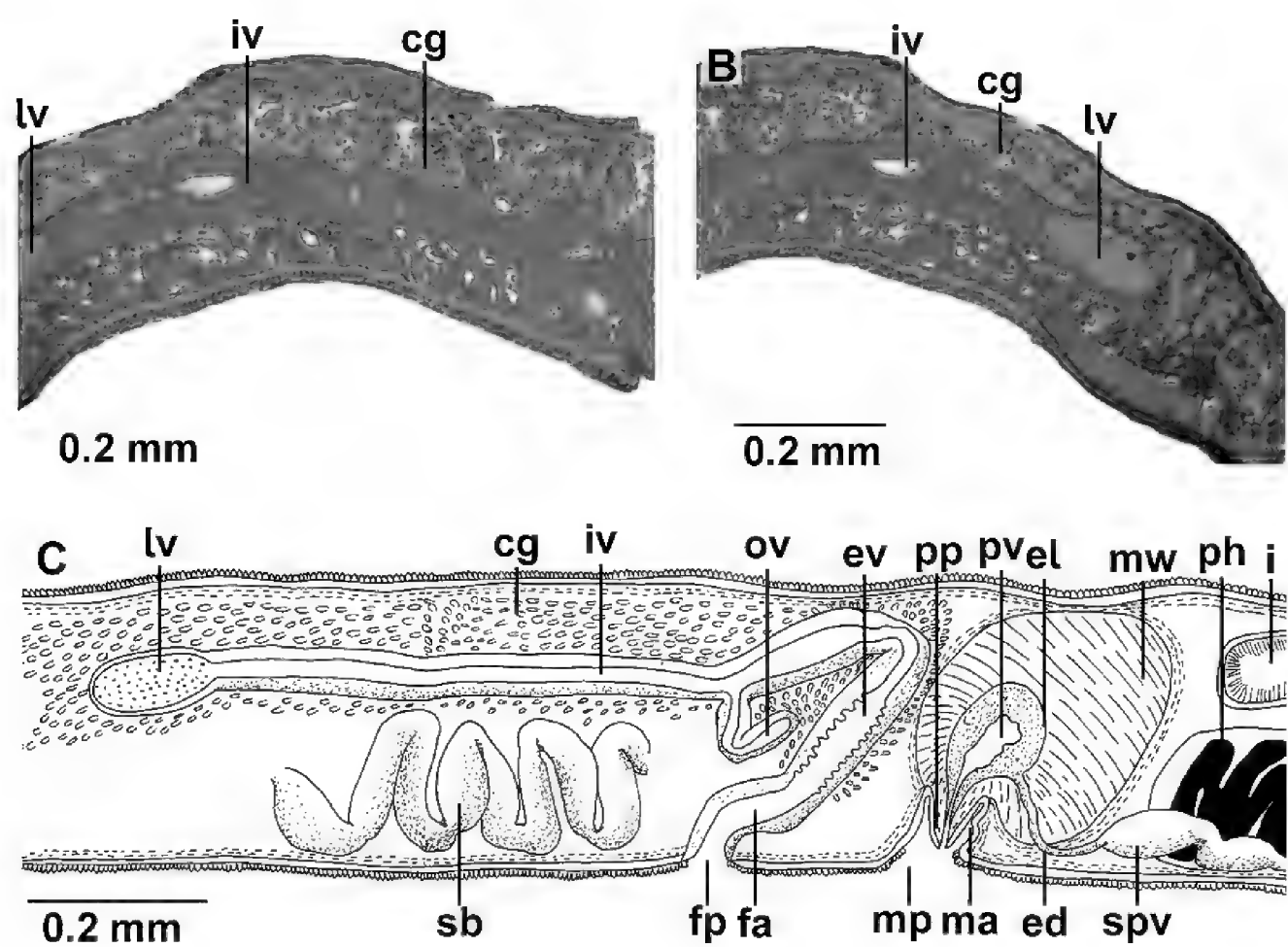


Figure 7. *Plehnia cascaisensis* sp. nov. (holotype, MNHNC MB16-000107). Histological sections are postero-anteriorly oriented: **A.** Histological section of the long internal vagina (holotype); **B.** Histological section of the end of the internal vagina and Lang’s vesicle (holotype); **C.** Sagittal reconstruction of the reproductive system (holotype). Abbreviations: cg, cemental glands; ed, ejaculatory duct; el, epithelial lining; ev, external vagina; fp, female pore; i, intestine; iv, internal vagina; lv, Lang’s vesicle; ma, male atrium; mp, male pore; mw, muscular wall; ov, oviduct; ph, pharynx; pp, penis papilla; pv, prostatic vesicle; sb, spermiducal bulbs; spv, spermiducal vesicle.

Table 3. Comparison among the species of the genus *Plehnia*.

	<i>Plehnia ellipsoides</i> (Girard in Stimpson 1854)	<i>Plehnia arctica</i> (Plehn, 1896)	<i>Plehnia caeca</i> Hyman, 1953	<i>Plehnia ovatus</i> (Kato, 1937)	<i>Plehnia cascaisensis</i> sp. nov.
Shape of the body	Elliptical	Oval	Elliptical	Oval	Elongated
Body length	25.4 mm	60 mm	10-14 mm	4.5 mm long (fixed)	9 mm (fixed)
Dorsal colour	Yellowish-brown	-	Whitish-greyish	Darkish brown	Yellowish-brown. Several brown spots scattered
Ventral colour	Grey	-	-	-	Pale yellow
Nuchal tentacles	Absent	Absent	Absent	Present	Present
Tentacular eyes	Present	Not seen	Absent	Present	Present
Cerebral eyes	Present	Not seen	Absent	Present	Present
Marginal eyes	Present	Not seen	Absent	Present	Present
Pharynx	Central	Behind the centre of the body	“...slightly posterior to the central area of the body”	Central	Behind the centre of the body
Genital pores	Separated	Separated	Separated	Separated	Separated
Connection of the spermiducal vesicles with the prostatic vesicle	Distal	Distal	Medial	Medial	Medial
Prostatic vesicle	Large, bulbous	-	Pear-shaped	Large	Pear-shaped
External vagina	Strong	-	Long and vertical	Strong	Wide
Internal vagina	Narrow and long	-	Short and horizontal	Wide	Narrow and very long
Lang’s vesicle	Elongated	-	Absent	Large	Small and oval shaped
Distribution	USA, Canada	Norway, Greenland	California (USA)	Japan	Spain
References	Stimpson (1854); Verrill (1893); Hyman (1940)	Plehn (1896); Steinböck (1932)	Hyman 1953	Kato (1937)	This study

Superfamily LEPTOPLANOIDEA Faubel, 1984
Family LEPTOPLANIDAE Stimpson, 1857
Genus *Leptoplana* Ehrenberg, 1831

Leptoplana mediterranea (Bock, 1913)

Fig. 8

Leptoplana tremellaris mediterranea Bock, 1913.

Material examined. • MNHNC MB16-000100, Station 1, 8 September 2016, 24 mm long, sagittal sectioned into 12 slides; • MNHNC MB16-000113, Station 1, 8 September 2016, 24 mm long; • MNHNC MB16-000133, Station 1, 8 September 2016, 24 mm long; • MNHNC MB16-000101, Station 1, 8 September 2016, 22 mm long, sagittally sectioned into 3 slides; • MNHNC MB16-000102, Station 1, 8 September 2016, 23 mm long, sagittally sectioned into 4

slides; • MNHNC MB16-000111, Station 1, 8 September 2016, 18 mm long; • MNHNC MB16-000103, Station 1, 8 September 2016, 25 mm long, sagittally sectioned into 18 slides; • MNHNC MB16-000112, Station 1, 8 September 2016, 20 mm long; • MNHNC MB16-000115, Station 1, 8 September 2016, 21 mm long; • MNHNC MB16-000122, Station 2, 28 October 2018, 17 mm long, sagittally sectioned into 13 slides; • MNHNC MB16-000121, Station 2, 28 October 2018, 17 mm long, sagittally sectioned into 28 slides; • MNHNC MB16-000123, Station 2, 10 November 2018, 14 mm long, sagittally sectioned into 50 slides; • MNHNC MB16-000116, Station 4, 23 February 2019, 23 mm long, sagittally sectioned into 20 slides; • MNHNC MB16-000117, Station 4, 23 February 2019, 28 mm long, sagittally sectioned into 21 slides; • MNHNC MB16-000118, Station 4, 23 February 2019, 19 mm long, sagittally sectioned into 27 slides; • MNHNC MB16-000119,

Station 4, 23 February 2019, 13 mm long, sagittally sectioned into 17 slides; • MNHNC MB16-000120, Station 4, 23 February 2019, 18 mm long, sagittally sectioned into 16 slides; • MNCN 4.01/3968 to 3981, Station 11, 10 May 2015, 14 mm long, sagittally sectioned into 13 slides. All of the measurements from the description refer to this specimen; • MNCN 4.01/3382 to 3393, Station 11, 10 May 2015, 11 mm long, sagittally sectioned into 12 slides; • MNCN 4.01/3982, Station 11, 11 April 2016, 11 mm long; • MNCN 4.01/3409 to 3416, Station 12, 6 December 2013, 13 mm long, sagittally sectioned into 8 slides; • MNCN 4.01/3417 to 3428, Station 12, 6 December 2013, 15 mm long, sagittally sectioned into 12 slides; • MNCN 4.01/3429 to 3447, Station 12, 6 December 2013, 17 mm long, sagittally sectioned into 19 slides; • MNCN 4.01/3394 to 3408, Station 12, 6 December 2013, 16 mm long, sagittally sectioned into 15 slides.

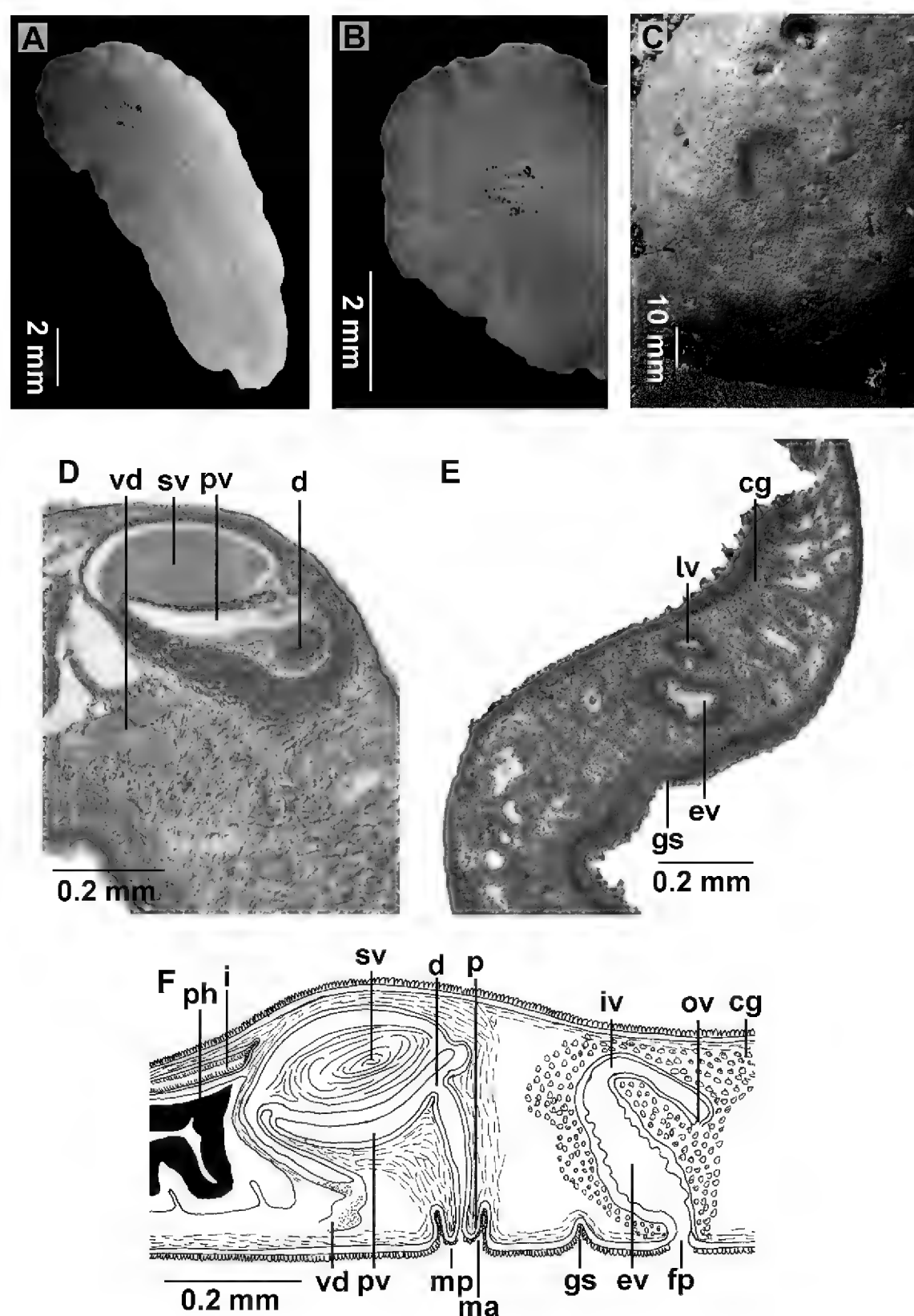


Figure 8. *Leptoplana mediterranea* (MNCN 4.01/3968 to 3981) Histological sections are antero-posteriorly oriented: **A.** Dorsal view of the living specimen; **B.** Detail of the eyes; **C.** Example of the environment where the specimen was found; **D.** Histological section of the male copulatory apparatus; **E.** Histological section of the female copulatory apparatus; **F.** Sagittal reconstruction of the reproductive system. Abbreviations: cg, cemental glands; d, diverticula; ev, external vagina; fp, female pore; gs, genital sucker; i, intestine; iv, internal vagina; ma, male atrium; mp, male pore; ov, oviduct; p, penis; ph, pharynx; pv, prostatic vesicle; sv, seminal vesicle; vd, vas deferens.

Description. Elongated worm, wider in the anterior end and narrower in the posterior end. Length between 11 mm and 31 mm (18.42 ± 4.58 mm). Ground colour of the dorsal surface, beige brownish in the pharynx area (Fig. 8A). Tentacles absent. A whitish colour is observed in the brain area, allowing clear observation of approx. 35 cerebral and 26 tentacular eye clusters (Fig. 8B). Ruffled pharynx between the first and second thirds of the body, mouth opening in the last third. Genital pores separated (approximately 0.33 mm) and located just behind the pharynx.

Reproductive system. Male reproductive system with a true and large seminal vesicle (0.28 mm long \times 0.14 mm wide), interpolated prostatic vesicle, and an unarmed penis cirrus, all enclosed in a muscular bulb (Fig. 8F). Vas deferens ventrally positioned, joining together before entering into the seminal vesicle. Seminal vesicle oval-shaped (Fig. 8D). Prostatic vesicle ventrally fastened to the seminal vesicle and separated by an epithelial common wall. Genital sucker located between the male and female pores.

Female complex simple and composed of a wide external vagina and a short and curved internal vagina. Lang's vesicle rudimentary (Fig. 8E, F). Numerous shell glands surround the whole female system.

Remarks. These diagnostic characters are present in the specimens collected during the present study, so this is the first report of the presence of *L. mediterranea* outside the Mediterranean.

Likewise, it is possible that the specimens found by Saldanha (1974) reported as *L. tremellaris* belong to *L. mediterranea* as well since some specimens of *L. mediterranea* were found close to Arrabida. However, this hypothesis needs to be confirmed with histological sections.

Biology. Under rocks (Fig. 8C, present study), but it was also found with *Caulerpa prolifera* (Chlorophyta) (Marquina et al. 2014a).

Distribution. Widely distributed along the Mediterranean coasts, *L. mediterranea* was reported as *L. tremellaris* “forma mediterranea” in Palermo (Grube 1840), Naples (Lang 1884; Palombi 1936), the Gulf of Lyon (Pruvot 1897), Trieste (Micoletzky 1910), Port Said (Palombi 1928), the Adriatic Sea (Steinböck 1933), the Italian coasts (Galleni and Gremigni 1989), and Catalonia (Novell 2001). Tunisia (Gammoudi et al. 2012, 2017); Mar Menor, SE Spain (Marquina et al. 2014a); and the southern plus western Iberian Peninsula (present study). This is the first record of *L. mediterranea* in Oporto (Portugal).

Genus *Parviplana* Hyman, 1953

Parviplana jeronimoi Pérez-García, Noreña & Cervera, 2018

Fig. 9

Material examined. • MNCN 4.01/4263, Station 11, 23 December 2014, 29 mm.

Type locality. La Caleta Beach, Cádiz.

Description. *Parviplana* species with elongated body shapes, dorsal background colour yellow-brown, ventrally pale yellow. Paired cerebral and tentacular eyes. Genital pores separated. Male apparatus with a true seminal vesicle, interpolated and bulb-shaped prostatic vesicle, and massive penis papilla, while the female system shows a vagina bulbosa and a well-developed Lang's vesicle (for more details, see Pérez-García et al. 2019).

Remarks. The genus *Parviplana* comprises four species and is one of the least numerous genera within Polycladida. *Parviplana jeronimoi* is a very common species in Cadiz and Sancti Petri (Chiclana). Nevertheless, this species has not been reported in other localities until now. The other species of the genus are *Parviplana hymani* Faubel, 1983, and *P. lynca* (Du-Bois Reymond Marcus, 1958), which are from the Pacific and West Atlantic Oceans, respectively. Finally, after the Iberian species were described, *P. sodade* was described by Cuadrado et al. (2021) from Cape Verde.

Biology. This species was collected and always observed under stones in the intertidal zone.

Distribution. only known from several localities on the coasts of Cadiz, southern Spain (see Pérez-García et al. 2019).

Family GNESIOCEROTIDAE Du-Bois Reymond Marcus & Marcus, 1966

Genus *Echinoplana* Haswell, 1907

Echinoplana celerrima Haswell, 1907

Fig. 10

Material examined. • MNHNC MB16-000104, Station 7, 13 May 2018, 16 mm long. All the measurements from the description refer to this specimen; • MNCN 4.01/3983, Station 11, 19 February 2015, 9 mm long.

Morphology. Elongated worm, wider in the anterior margin with a blunt end (Fig. 10A). Length between 9 and 16 mm alive (12.5 ± 4.95 mm). Dorsal colour caramel and translucent intestinal branches are easily observed and vary from brown to green. Central part of the body darkish brown. Tentacles absent. Tentacular and cerebral eye clusters present, distributed parallelly and in two long rows (Fig. 10B). Tentacular and cerebral eyes clustered in approximately 32 and 43 eyes, respectively. Pharynx ruffled, located in the second third of the body. Oral pore in the last third of the pharynx.

Reproductive system. Genital pores separated (separated approximately 2.26 mm). Male apparatus (4.3 mm long) characterised by a seminal vesicle, an interpolated prostatic vesicle, and a conspicuous cirrus shown by transparency (Fig. 10C). Female system with a large vagina (2.29 mm), a ductus vaginalis, and Lang's vesicle in its distal region.

Remarks. *Echinoplana celerrima* is the only species of the genus *Echinoplana* described by Haswell (1907) from

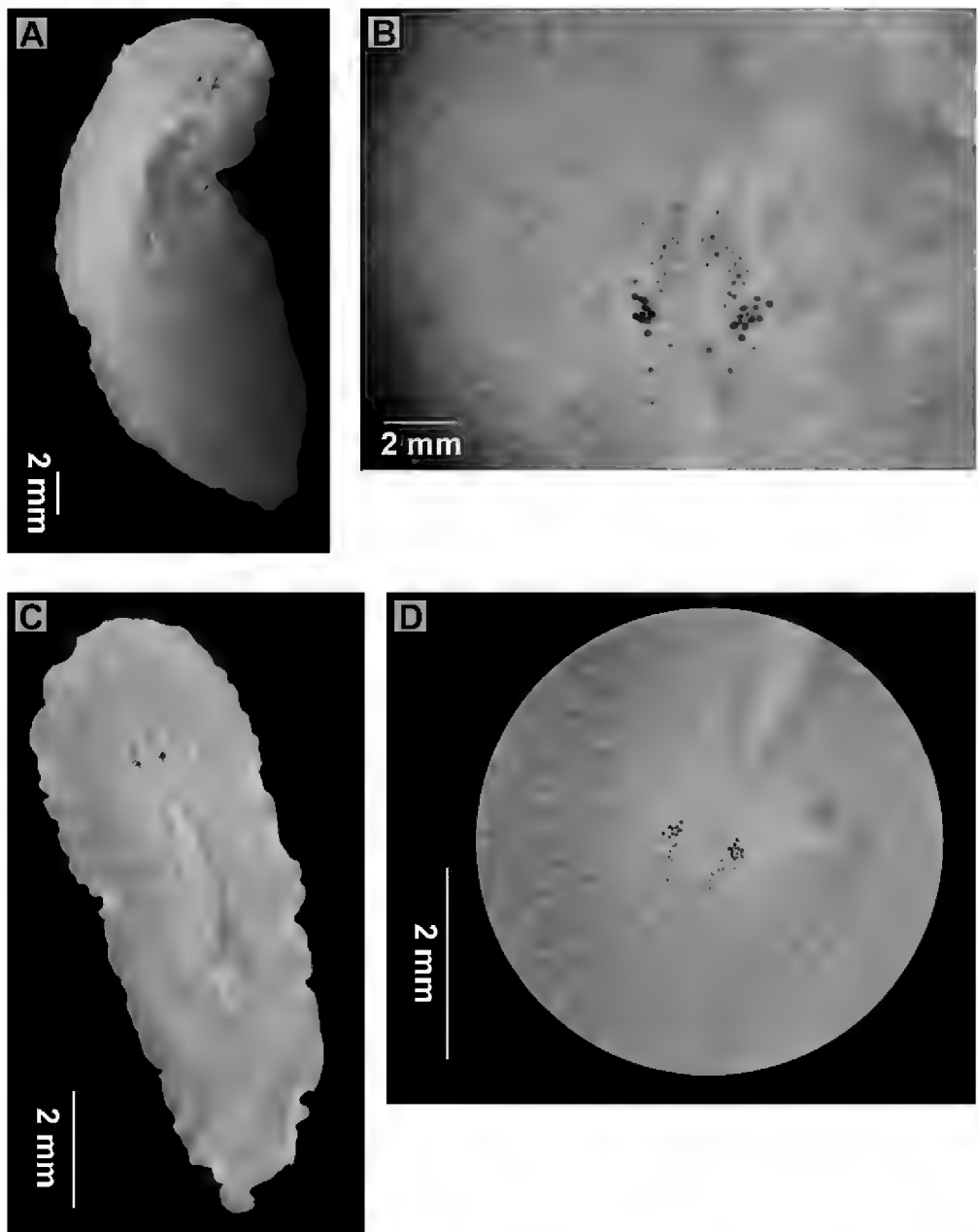


Figure 9. *Parviplana jeronimoi* (MNCN 4.01/4263): **A–C.** Dorsal view of living specimens; **B–D.** Detail of the eyes.

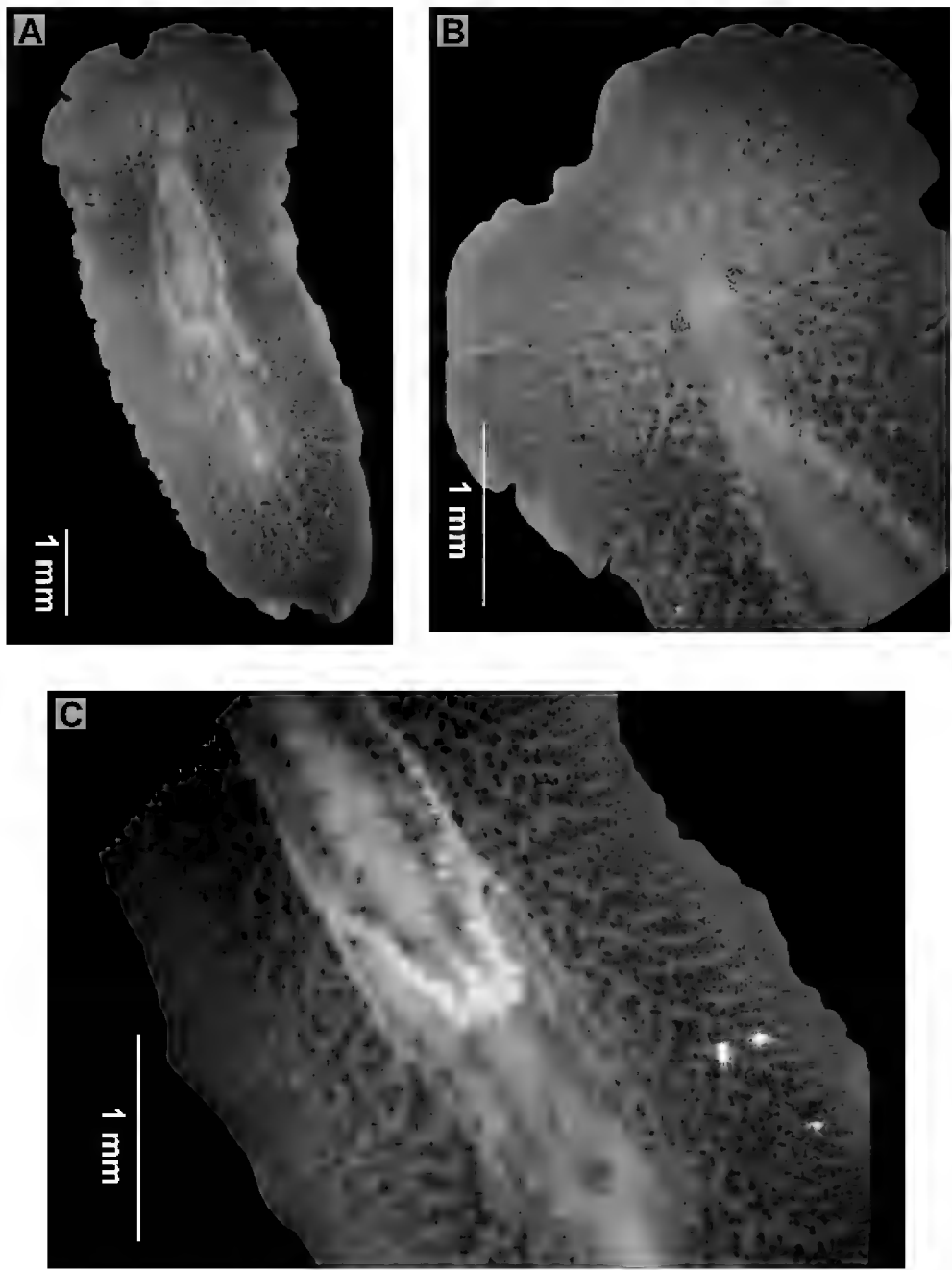


Figure 10. *Echinoplana celerrima* (MNHNC MB16-000120): **A.** Dorsal view of the living specimen; **B.** Detail of the eyes; **C.** Ventral view of the living specimen, showing the male copulatory apparatus.

Port Jackson, Sidney, Australia. After that, Galleni (1978) reported this species in the Port of Livorno, Italy, which was the first record of the species in the Mediterranean. Later, Holleman (2007) reported this species on the Pacific coast on the North Island of New Zealand. *E. celerrima* was also recorded in the lagoon of Tunis (Gammoudi et al. 2009; 2017) and now in the southern Iberian Peninsula (present study). Considering the geographical distance between the specimens from Australia, New Zealand, and the Mediterranean Sea, the contrast of information provided by the morphological characteristics and the DNA analyses (using nuclear and mitochondrial markers) is crucial to elucidating whether the populations belong to the same species.

Biology. In this study, the specimens were collected under stones in the intertidal zone. Furthermore, *Echinoplana celerrima* frequently inhabits areas with human activity, such as harbours (Haswell 1907, Galleni 1978). Hence, the specimen of Sagres was precisely collected in a rocky area attached to a harbour zone, supporting one of the possible scenarios about the dispersion of this species (Prudhoe 1982).

Distribution. As previously explained, *Echinoplana celerrima* is widely distributed on the southeastern coast of Australia (Haswell 1907; Prudhoe 1982; Johnston and Lee 2008; Rodríguez et al. 2021), Livorno, Italy (Galleni 1978), New Zealand (Holleman 2007), Tunisia (Gammoudi et al. 2009, 2017), and Catalonia, Spain (Gammoudi and Tekaya 2012). Our specimens provide the first reports of this species on the North-Atlantic shores of Portugal and Andalusia (Spain).

**Family NOTOPLANIDAE Du-Bois Reymond
Marcus & Marcus, 1966
Genus *Notoplana* Laidlaw, 1903**

***Notoplana alcinoi* (Schmidt, 1861) Bock, 1913**

Fig. 11

Leptoplana alcinoi Schmidt, 1861.

Opisthoporus tergestinus Minot, 1877.

Material examined. • MNCN 4.01/3476 to 3492, Station 11, 29 April 2014, 23 mm long, sagittal sectioned into 17 slides. All of the measurements from the description refer to the following specimens: • MNCN 4.01/3984, Station 11, 19 February 2015, 9 mm long; • MNCN 4.01/3985 to 4007, Station 11, 10 May 2015, 10 mm long, transversally sectioned into 22 slides; • MNCN 4.01/4008, Station 11, 10 May 2015, 22 mm long; • MNCN 4.01/4083, Station 11, 19 May 2016, 23 mm long; • MNCN 4.01/4084, Station 11, 19 May 2016, 16 mm long; • MNCN 4.01/3955, Station 11, 22 March 2019, 16 mm long; • MNCN 4.01/4009 to 4045, Station 12, 21 March 2015, 21 mm long, transversally sectioned into 37 slides; • MNCN 4.01/4046 to 4070, Station 12, 21 March 2015, 16 mm long, sagittally sectioned into 25 slides; and • MNCN 4.01/4071 to 4082, Station 12, 18 April 2015, 11 mm long, sagittally sectioned into 12 slides.

Description. Notoplanidae with elongated and narrow body, very delicate and fragile appearance. Maximum length alive approximately 23 mm (mean 16.7 ± 5.41). Without tentacles. Transparent, whitish background colour, sometimes with a yellowish spot in the pharynx area (Fig. 11A). Visible intestinal branches colouring the dorsal surface with brownish or dark green shades. Paired tentacular and cerebral eye clusters present, with 9 tentacular and 17 cerebral eyes in each cluster (Fig. 11B). Pharynx ruffled, located between the first and second thirds of the body. Mouth opening in the last third of the pharynx. Gonopores separated but very close together (at 0.1 mm distance) behind the pharyngeal cavity (Fig. 11D, E).

Reproductive system. Male copulatory apparatus is composed of a true seminal vesicle, an interpolated prostatic vesicle, and a deep atrium that hosts a stylet (Fig. 11E). Vas deferens enter the seminal vesicle separately. Seminal vesicle elongated, bent in two sections. Prostatic vesicle rounded and large (0.54 mm long and 0.4 mm wide) with five tubular chambers joined to the ejaculatory duct (Fig. 11C, E). One specimen with 8 chambers instead of 5 (see Fig. 11F). Muscular wall of the prostatic vesicle (0.12 mm wide) crossed by numerous extravascular glands. Penis stylet long (0.6 mm), slender and pointed, and housed in a deep atrium (0.42 mm).

Female copulatory apparatus consists of a smooth external vagina, a narrow internal vagina, and an elongated Lang's vesicle (Fig. 11D, E). Numerous cement glands surround the whole female organs. The external vagina curves dorsally to the posterior end. The common oviduct enters the internal vagina ventrally. Lang's vesicle is large (0.5 mm) and wavy, extending backwards (Fig. 11E).

Remarks. *Notoplana* is one of the most species-rich genera within Polycladida, with 36 accepted species (Tyler et al. 2006–2024). Regarding the Mediterranean Sea and the Atlantic coasts of the Iberian Peninsula, the recorded species of this genus are *N. atomata* (Müller OF, 1776) Bock 1913 and *N. vitrea* (Lang, 1884) Bock 1913 (Novell 2001 Marquina et al. 2014b), which are species from northern and southern Europe, respectively. More recently, *N. alcinoi* was recorded in Tunisia (Gammoudi et al. 2017).

Our identification of *N. alcinoi* was based on the description and the drawings provided by Lang (1884), because the original description (Schmidt 1861) is too brief for comparison. The specimens of *N. alcinoi* from Cádiz and those described by Lang hardly differ, except for the folded external vagina and the large Lang's vesicle in comparison to the smooth external vagina and short Lang's vesicle described by Lang. However, these female features depend on the state of maturation (Litvaitis et al. 2019).

Biology. Collected from rocky substrates in the intertidal zone. The original description mentioned the presence of this species in the algae *Ellisolandia* and *Chondria* (Rhodophyta) environments.

Distribution. This species was reported for the first time in Corfu, Greece (Schmidt 1861) and later in Trieste, Italy (Minot 1876; Micoletzky 1910), Naples, Italy (Lang 1884), Cape Verde (Laidlaw 1906), and Tunisia (Gam-

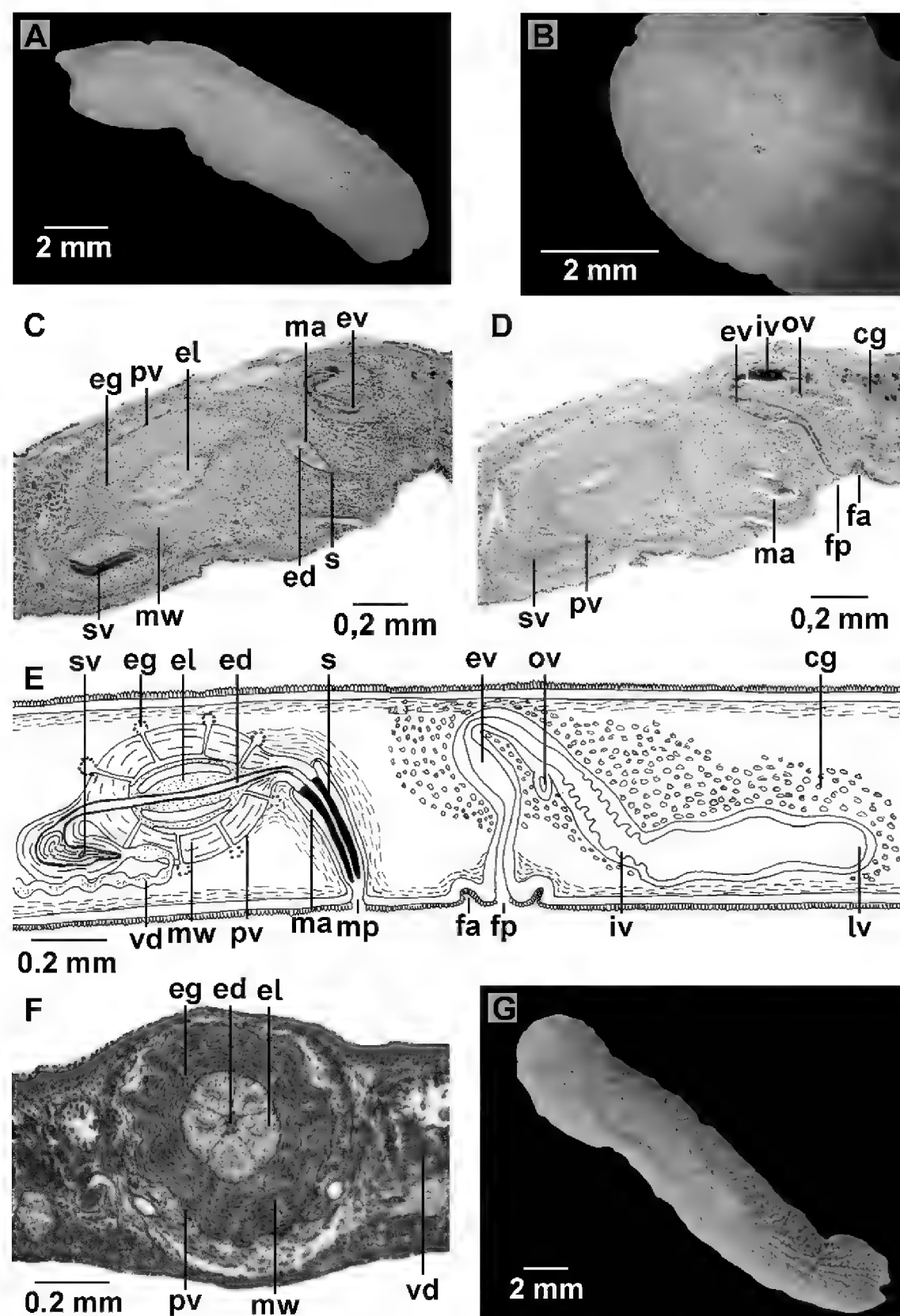


Figure 11. *Notoplana alcinoi* (MNCN 4.01/3476 to 3492). Histological sections are antero-posteriorly oriented: **A.** Dorsal view of the living specimen; **B.** Detail of the eyes; **C.** Histological section of the male copulatory organs; **D.** Histological section of the female copulatory organs; **E.** Transversal section of the prostatic vesicle; **G.** Dorsal view of a living specimen showing a different morphotype (MNCN 4.01/4008). Abbreviations: cg, cemental glands; ed, ejaculatory duct; eg, extravascular glands; el, epithelial lining; ev, external vagina; fa, female atrium; fp, female pore; i, intestine; iv, internal vagina; lv, Lang's vesicle; ma, male atrium; mp, male pore; mw, muscular wall; ov, oviduct; pv, prostatic vesicle; s, stylet; sv, seminal vesicle; vd, vas deferens.

moudi et al. 2017). The presence of this species in the Iberian Peninsula is reported for the first time.

Family PLEIOPLANIDAE Faubel, 1983

Genus *Izmira* Bulnes, 2010

Izmira lusitanica sp. nov.

<https://zoobank.org/00043DB7-4270-48F4-AB2D-BC5533D3094F>

Fig. 12

Holotype. • MNHNC MB16-000124, Station 4, 8 December 2018, 21 mm fixed, sagittal sectioned into 16 slides.

Additional material. • MNHNC MB16-000134, Station 4, 9 March 2019, 13 mm, juvenile.

Diagnosis. Pleioplanidae with transparent body; tentacles absent; with cerebral eyes, gonopores separated;

small and bean-shaped seminal vesicle; prostatic vesicle oval; elongated penis papilla; female apparatus with a vagina bulbosa.

Description. Body shape elongated and delicate, widened anteriorly and tapered distally. The mature specimen is approximately 21 mm long when alive, while the juvenile specimen is approximately 13 mm in length.

Dorsal surface transparent, brownish-coloured intestinal branches easily observable (Fig. 12A), central longitudinal area lacks pigmentation. Ventral side translucent. Tentacles absent. Paired clusters of tentacular and cerebral eyes present, with approximately 28 tentacular eyes and 42 cerebral eyes in each cluster (Fig. 12B). Pharynx ruffled and centrally located between the second and third fourths of the body, oral pore at the beginning of the last third of the pharynx. Gonopores separated and located between the third and the last fourth of the body.

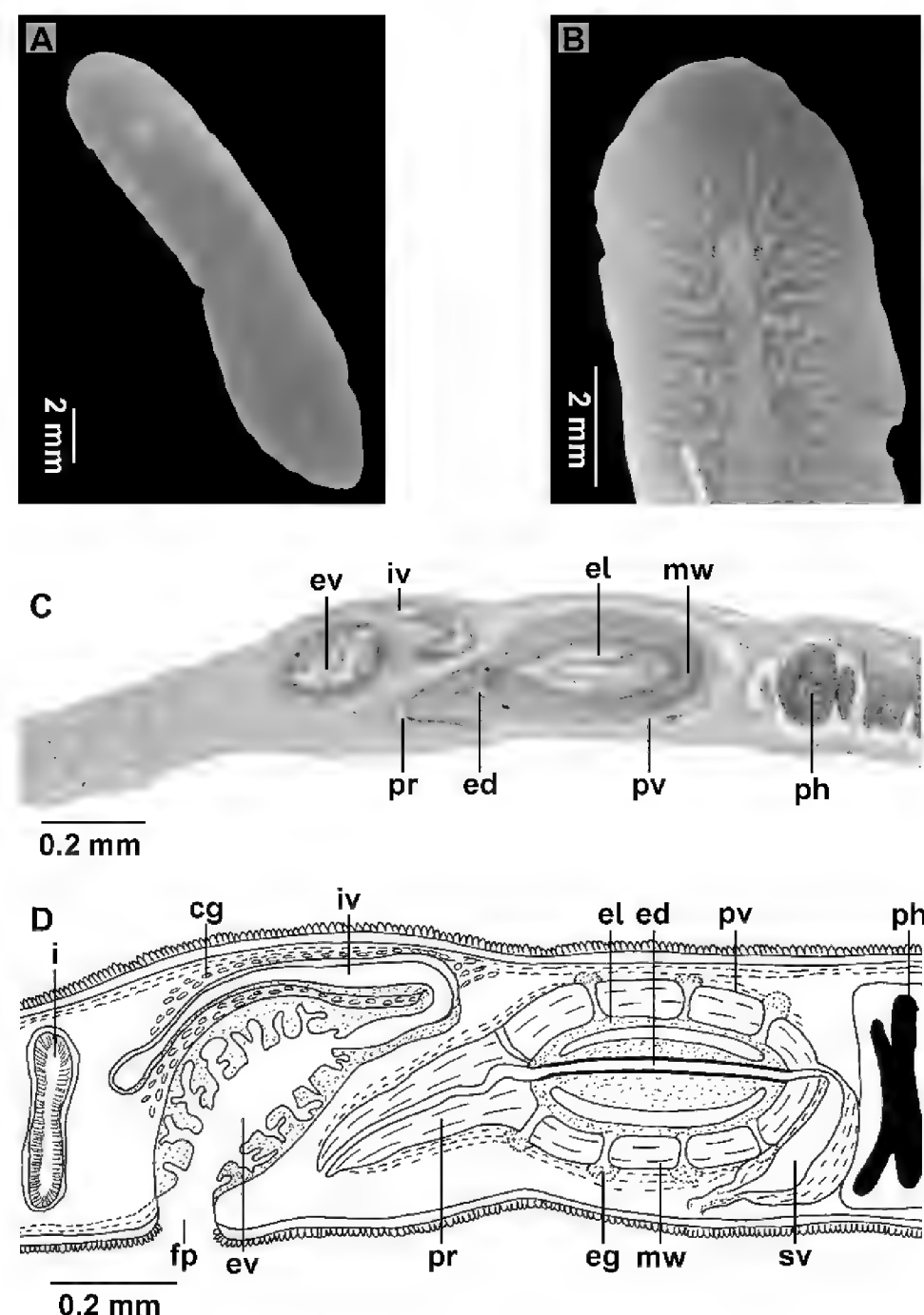


Figure 12. *Izmira lusitanica* sp. nov. (holotype, MNHNC MB16-000124). Histological sections are postero-anteriorly oriented: **A.** Dorsal view of a living specimen; **B.** Detail of the tentacular and cerebral eyes (holotype); **C.** Histological section of the reproductive system (holotype); **D.** Sagittal reconstruction of the reproductive system (holotype). Abbreviations: cg, cemental glands; ed, ejaculatory duct; eg, extravesicular glands; el, epithelial lining; ev, external vagina; fp, female pore; i, intestine; iv, internal vagina; mw, muscular wall; ph, pharynx; pr, penis rod; pv, prostatic vesicle; sv, seminal vesicle.

Reproductive system. Male reproductive organs composed of a true seminal vesicle, an interpolated oval-shaped prostatic vesicle, and a long penis rod. Vas deferens thick, forming spermiducal bulbs that run ventrally and proximally and enter separately into the seminal vesicle. Seminal vesicle bean-shaped and small (0.25 mm) located proximal to the prostatic vesicle (Fig. 12D). Prostatic vesicle well developed (0.5 mm), with chambered epithelial linings (Fig. 12C, D). Ejaculatory duct runs from the proximal to the distal end of the prostatic vesicle. Penis papilla muscular, broad (0.35 mm long; 0.09 mm wide), and conical (Fig. 12C, D). Diameter of the penis papilla decreases from proximal to distal.

Female copulatory apparatus with a wide external vagina (0.21 mm) with several folds and a bulbous vagina (Fig. 12C, D). Internal vagina long and narrow, without Lang's vesicle. Several cement glands surround the internal vagina.

Type locality. Area Marinha Protegida das Avenças, Parede, Cascais, Portugal.

Etymology. The specific name refers to Lusitania, the original Roman name of the region from Portugal where the holotype was collected.

Remarks. The genus *Izmira* was established by Bulnes in 2010 based on specimens from the Aegean Sea. The representatives of this genus are characterised by an oval or elongated body, absence of tentacles, presence of tentacular eyes, absence of cerebral, frontal, or marginal eyes, separated gonopores, a true seminal vesicle, an interpolated “atomata” type of prostatic vesicle, a penis rod, and a female reproductive system with a vagina bulbosa and without Lang's vesicle. The species described in the present work shows these features except for the presence of cerebral eyes, which are observable in *I. lusitanica* sp. nov.

The genus *Izmira* comprises only two previously known species: *I. cinari* Bulnes 2010 and *I. turkeyi* Bulnes 2010. *I. lusitanica* sp. nov. shares several characteristics with *I. turkeyi*, including separated gonopores, the presence of spermiducal bulbs, a similar length of the penis rod, and a similar structure of the vagina bulbosa. However, they exhibit notable differences; for instance, the body shape of *I. turkeyi* is oval, whereas that of *I. lusitanica* sp. nov. is elongated; the colouration of *I. turkeyi* tends to be dark, whereas that of *I. lusitanica* sp. nov. is distinctly transparent; and *I. turkeyi* possesses tentacle

knobs, a feature absent in the new species. Furthermore, the presence of cerebral eyes distinguishes the two species; *I. turkeyi* lacks them, whereas *I. lusitanica* sp. nov. has them. Notably, *I. turkeyi* has a seminal vesicle longer than the prostatic vesicle, whereas *I. lusitanica* sp. nov. has a bean-shaped seminal vesicle, smaller than the prostatic vesicle. Moreover, the prostatic vesicle is small and rounded in *I. turkeyi* but large and oval-shaped in the new species. The shape of the penis papilla also differs significantly: in *I. turkeyi*, the penis papilla forms a rounded pouch distally, whereas in *I. lusitanica* sp. nov., it narrows and has a conical shape.

On the other hand, significant differences exist between *I. cinari* and *I. lusitanica* sp. nov.. *I. cinari* is light brown and darker medially, while *I. lusitanica* sp. nov. is transparent. Cerebral eyes are absent in *I. cinari* but present in *I. lusitanica* sp. nov.. The seminal vesicle in *I. cinari* is longer than the prostatic vesicle, whereas in *I. lusitanica* sp. nov., it is bean-shaped and small. Additionally, the prostatic vesicle is different: rounded in *I. cinari* and large and oval in *I. lusitanica* sp. nov.. The penis papilla of the Turkish species is longer than that of the new species.

These observed differences between the valid *Izmira* species and the unique combination of characteristics observed in *I. lusitanica* sp. nov. led us to consider the specimens from Avencas as a new species. This is the first record of the genus *Izmira* outside the Mediterranean.

Family STYLOCHOPLANIDAE Faubel, 1983

Genus *Emprostopharynx* Bock, 1913

Emprostopharynx onubensis sp. nov.

<https://zoobank.org/8B51F8D2-5B3B-484A-927C-8B7E6DA4BB32>

Fig. 13

Holotype. • MNCN 4.01/2799 to 2819, Station 10, 21 February 2019, 25 mm, sagittal sectioned into 20 slides.

Diagnosis. Elongated oval Stylochoplanidae with yellowish brown colour; tentacles absent; gonopores separated; with spermiducal bulbs and tubular seminal vesicle; interpolated prostatic vesicle pear-shaped, with smooth irregular epithelium; female apparatus with vagina bulbosa; without Lang's vesicle.

Description. Elongated oval body, with few marginal folds. Dorsal colouration yellowish-brown with a translucent appearance and intense pigmentation in the pharyngeal region (Fig. 13A, B). Intestinal branches patent. Ventral side yellowish-brown. Without tentacles. Clusters of tentacular and cerebral eyes located anterior to the brain, with 19 tentacular eyes and 21 cerebral eyes per cluster (Fig. 13C). Few cerebral eyes posterior to the brain. Pharynx ruffled in the first half of the body, and the oral pore in the second third of the pharynx. Gonopores separated (0.9 mm) and positioned immediately behind the pharynx.

Reproductive system. Male copulatory apparatus comprises spermiducal bulbs (Fig. 13D), an interpolated prostatic vesicle encircled by well-developed muscle

layers and crossed by extravasicular glands, and a short penis papilla (Fig. 13E, G). Vasa deferentia ventrally and dilated in spermiducal bulbs enter separated into the tubular seminal vesicle (Fig. 13E). Prostatic vesicle elongated and oval, 1 mm in length, with a thick muscular wall (0.18 mm wide). Epithelial lining of the prostatic vesicle well-developed and irregular. Penis papilla short (0.2 mm long) and opens distally into a ciliated male atrium (0.18 mm wide and 0.36 mm deep), including a characteristic diverticulum just before the male pore (Fig. 13E).

The female reproductive system comprises a folded and ciliated external vagina and the vagina bulbosa (Fig. 13F). The external vagina extends dorsally and then curves backwards, forming a narrower internal vagina. Without Lang's vesicle.

Type locality. El Portil, Huelva, Spain.

Etymology. The specific name refers to Onuba, the Latin name of Huelva, the area where the holotype was collected.

Remarks. The genus *Emprostopharynx* was established by Bock in 1913 and classified within the family Stylochoplanidae. This family is characterised by a simple male copulatory apparatus, a small tubular seminal vesicle, a prostatic vesicle lined with irregular epithelium, and a female reproductive system lacking Lang's vesicle (Fig. 13D).

In Table 4, it is evident that *E. onubensis* sp. nov. exhibits unique characteristics that distinguish it from other species within the genus, leading to the classification of a new species. Its external morphology includes yellow-brown dorsal pigmentation, numerous tentacular (19), and cerebral eyes (21). Furthermore, it shares common features with few species, such as an elongated-oval body shape, a larger body size (more than 20 mm), and a pyriform prostatic vesicle, characters found in *E. rasae* only.

E. onubensis sp. nov. lacks tentacles, but the presence of this structure is not a very distinctive feature within the genus. For example, some species like *E. gracilis* and *E. hancocki* have tentacles, while others such as *E. opisthoporus* and *E. vanhoeffeni* have a rudimentary form of tentacle.

Of the nine species currently recognised in the genus (including *E. onubensis* sp. nov.), only *E. opisthoporus*, *E. rasae*, and *E. vanhoeffeni* have marginal eyes. The other six species, including *E. onubensis* sp. nov., lack marginal eyes. Usually, the pharynx is centrally located in the *Emprostopharynx*, but four species (*E. opisthoporus*, *E. rasae*, *E. heroniensis*, and *E. lysiosquillae*) share with *E. onubensis* sp. nov. an anterior pharynx position.

E. onubensis sp. nov. has separate gonopores, a shared feature with *E. pallida*, *E. opisthoporus*, *E. rasae*, and *E. lysiosquillae*. The other species have closely located gonopores. The prostatic vesicle in *E. onubensis* sp. nov. is pyriform, similar to *E. rasae*. In other species, the prostatic vesicle is oval, rounded, or elongated. Despite most species having an oval, rounded, or elongated seminal vesicle, *E. heroniensis* has a pear-shaped seminal vesicle, and *E. lysiosquillae* has a bean-shaped vesicle.

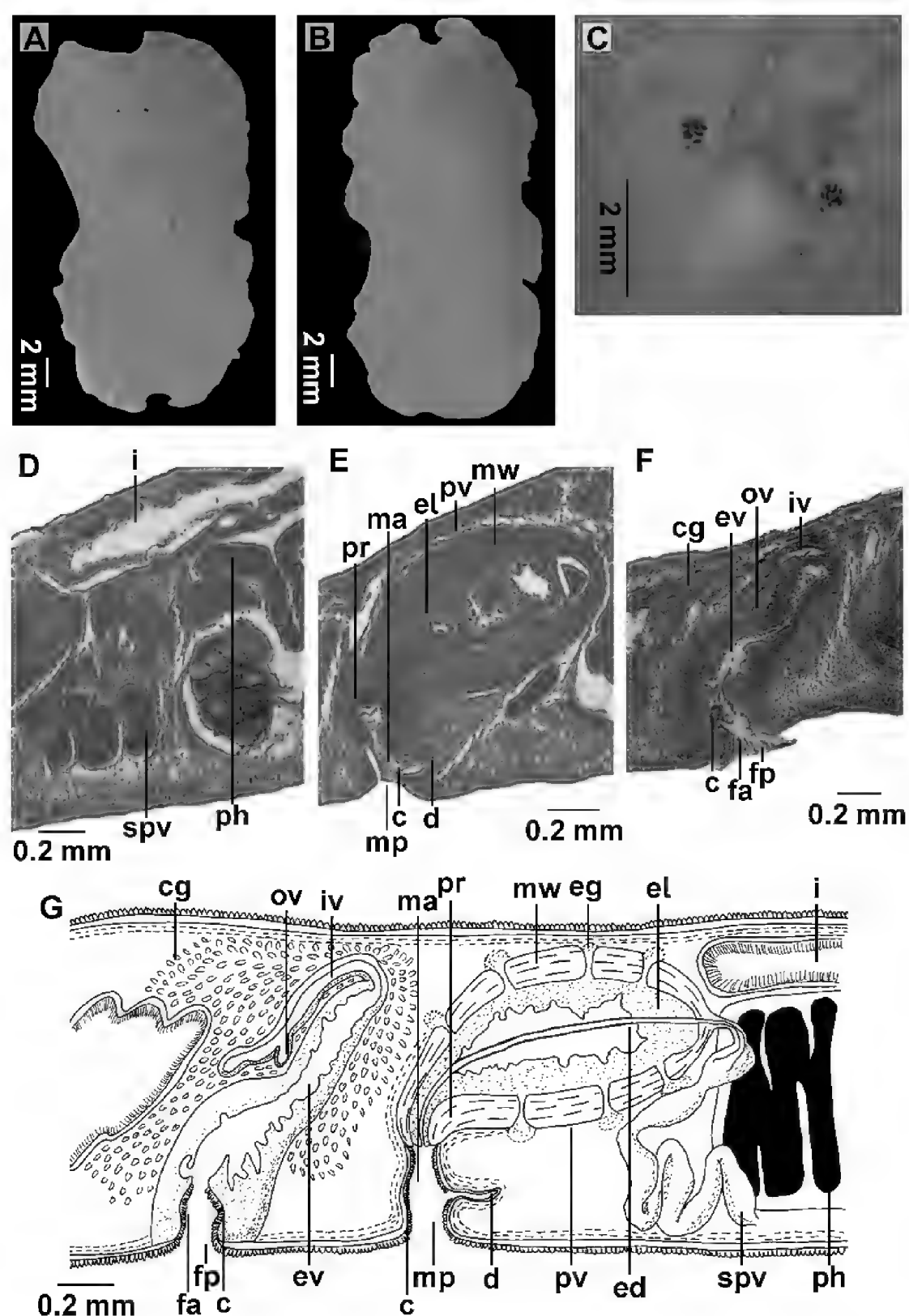


Figure 13. *Emprostopharynx onubensis* sp. nov. (holotype MNCN 4.01/2799 to 2819). Histological sections are postero-anteriorly oriented: **A.** Dorsal view of a living specimen; **B.** Ventral view; **C.** Detail of the eyes; **D.** Histological section of the spermiducal vesicles; **E.** Histological section of the male copulatory organs; **F.** Histological section of the female organs; **G.** Sagittal reconstruction of the reproductive system. Abbreviations: c, cilia; cg, cemental glands; d, diverticulum; ed, ejaculatory duct; eg, extravesicular glands; el, epithelial lining; ev, external vagina; fa, female atrium; fp, female pore; i, intestine; iv, internal vagina; ma, male atrium; mp, male pore; mw, muscular wall; ov, oviduct; ph, pharynx; pr, penis rod; pv, prostatic vesicle; spv, spermiducal vesicles; sv, seminal vesicle.

Furthermore, *E. onubensis* sp. nov. has a tubular seminal vesicle, a feature shared with *E. vanhoeffeni*. The penis papilla of *E. onubensis* sp. nov. is short, like most of the species within the genus. This one is distinguished from the elongated papilla of *E. pallida* and *E. heroniensis* and the pointed papillae of *E. hancocki* and *E. lysiosquillae* as well.

The genus *Emprostopharynx* is known from the American Pacific coast (e.g., *E. gracilis* and *E. hancocki* are from California), Australia (*E. heroniensis*), Hawaii (*E. rasae*), Ecuador (*E. opisthoporus*), and Japan (*E. lysiosquillae*). On the other hand, *E. pallida* and *E. vanhoeffeni* are known from the Cape Verde coast. *E. pallida* is also known from the Italian Mediterranean coast. *E. onubensis* sp. nov. represents the first record for the European and Iberian Atlantic coasts.

Genus *Comoplana* Faubel, 1983

Comoplana agilis (Lang, 1884) Faubel, 1983

Fig. 14

Stylochoplana agilis Lang, 1884.

Material examined. • MNHNC MB16-000125, Station 4, 8 December 2018, 8 mm long; • MNHNC MB16-000126, Station 8, 16 May 2018, 4 mm long; • MNHNC MB16-000127, Station 8, 17 May 2018, 3 mm long; • MNCN 4.01/3631 to 3633, Station 11, 28 October 2015, 4 mm long, sagittally sectioned into 3 slides; • MNCN 4.01/4085, Station 11, 28 October 2015, 4 mm long; and • MNCN 4.01/34634 to 3635, Station 11, 29 October 2015, 6 mm long, sagittally sectioned into 2 slides. All of the

Table 4. Comparison among the species of the genus *Emprostopharynx*.

	<i>E. pallida</i> (Quatrefage, 1845)	<i>E. gracilis</i> (Heath & Mcgregor, 1912)	<i>E. opistho- porus</i> Bock, 1913	<i>E. hancocki</i> (Hyman, 1953)	<i>E. rasae</i> Prudhoe, 1968	<i>E. her- oniensis</i> Beveridge, 2018	<i>E. lysiosquillae</i> Oya, Nakajima & Kajihara, 2022	<i>E. vanhoffeni</i> Bock, 1931	<i>E. onubensis</i> sp. nov.
Body Shape	Oval, pointed end	Oval,	Oval	Oval	Elongated oval	Oval	Oval	Oval	Elongated oval
Body length	20 mm	7.5 mm	9 mm	6 mm	20 mm	22 mm	2.6-5.8 mm	9.5 mm	25 mm
Dorsal colour	Transparent	Brownish-yel- low	Pale yellow	-	Reddish-brown	Pale orange	Whitish	Grey (con- served)	Yellowish brown
Tentacles	Absent	Present	Rudimentary	Present	Absent	Absent	Absent	Rudimentary	Absent
Tentacular eyes per cluster	-	4 eyes	4 eyes	4 eyes	2-4 eyes	10-12 eyes	Absent	5-6	19 eyes
Cerebral eyes `per cluster	-	14 eyes	7 eyes	8 eyes	3-5 eyes	5-8 eyes	2-6 eyes	4 eyes	21 eyes
Marginal eyes	Absent	Absent	Present	Absent	Present	Absent	Submarginal eyes present	Present	Absent
Pharynx	Central	Central	Somewhat anterior	Central	Somewhat anterior	Somewhat posterior	Somewhat anterior	Central	Somewhat anterior
Genital pores	Separated	Close together	Separated	Close together	Separated	Close together	Separated	Close together, in the caudal end	Separated
Prostatic vesicle	Oval	Round-oval	Oval	Cylindrical	Piriform	Elongated	Elongated	Elongated oval	Piriform
Seminal vesicle	Elongated	Oval	Rounded	Elongated	Elongated	Pear shaped	Bean-shaped	Tubular	Tubular
Penis papilla	Long	Short	Short	Pointed	Short	Long	Pointed penis stylet	Short	Short
Distribution	Italy, Cape Verde and Suez Canal	California	Ecuador	California	Hawaii	Australia	Japan	Cape Verde	Spain
References	Quatrefages (1845); Laidlaw (1903); Palombi (1928)	Heath and McGregor (1913); Hy- man (1953)	Bock (1913)	Hyman (1953)	Prudhoe (1968)	Beveridge (2018)	Oya et al. 2022	Bock (1931)	This study

measurements from the description refer to this specimen; • MNCN 4.01/4086, Station 11, 19 June 2018, 3 mm long; • MNCN 4.01/4087, Station 11, 19 June 2018, 3 mm long.

Description. small Stylochoplanidae, with lengths varying between 3 mm and 8 mm (4.33 ± 1.66 mm). Body shape elongated much wider in the anterior region and at the blunt posterior end (Fig. 14A). Dorsal colour differs from dark brown to dark green, with white or cream spots along the central longitudinal area. Conspicuous, cylindrical tentacles located at the anterior end to the beginning of body narrowing. Tentacular eyes (approximately 6 eyes per cluster) inside the tentacles and cerebral eyes (16 eyes per cluster) around the base of the tentacles. (Fig. 14B). Pharynx ruffled, located more or less central. Oral pore situated in the posterior part of the pharynx. Genital pores joining in a common atrium (Fig. 14C–E).

Reproductive system. Male copulatory system with true seminal vesicle, interpolated prostatic vesicle, and conical penis papilla (Fig. 14C–E). Vas deferens run ventrally and enter proximally into the seminal vesicle through a common duct. Seminal vesicle voluminous (0.12 mm long and 0.23 mm wide), kidney-shaped, and connected proximally to the prostatic vesicle. A narrow ejaculatory duct runs from the seminal vesicle to the lu-

men of the prostatic vesicle (Fig. 14D). Prostatic vesicle more or less rounded and well-developed (0.2 mm long and 0.28 mm wide), with a thick muscular wall (0.04 mm) pierced by extravesicular glands. Epithelial lining of the prostatic vesicle smooth. Penis papilla 0.2 mm long, with a sinuous trajectory to the deep and ciliated common atrium.

Female system with a narrow external and internal vagina, Lang’s vesicle present (Fig. 14D). External vagina runs dorsally and turns backwards, continuing to the internal vagina, which receives the common oviduct ventrally. Lang’s vesicle large, rounded (0.15 mm long and 0.1 mm wide), and lies on the ventral side of the body (Fig. 14C–E).

Biology. Due to its small size and colouration, this species is very cryptic on substrates such as stones or sand. The specimens studied were mainly found on algae such as *Halopteris scoparia*, *Dictyota dichotoma* (Ochrophyta), and *Ellisolandia elongata* (Rodophyta).

Distribution. Widely known from the Mediterranean, this species was reported in Naples, Italy (Lang 1884), the coasts of Catalonia (Novell 2001), and the Atlantic coasts of Europe, such as Galicia (Aguado et al. 2017), the North Sea (Karez 1991; Harms 1993), and the British coasts (Howson and Picton 1997). This is the first report of this species in Portugal and Andalusia.

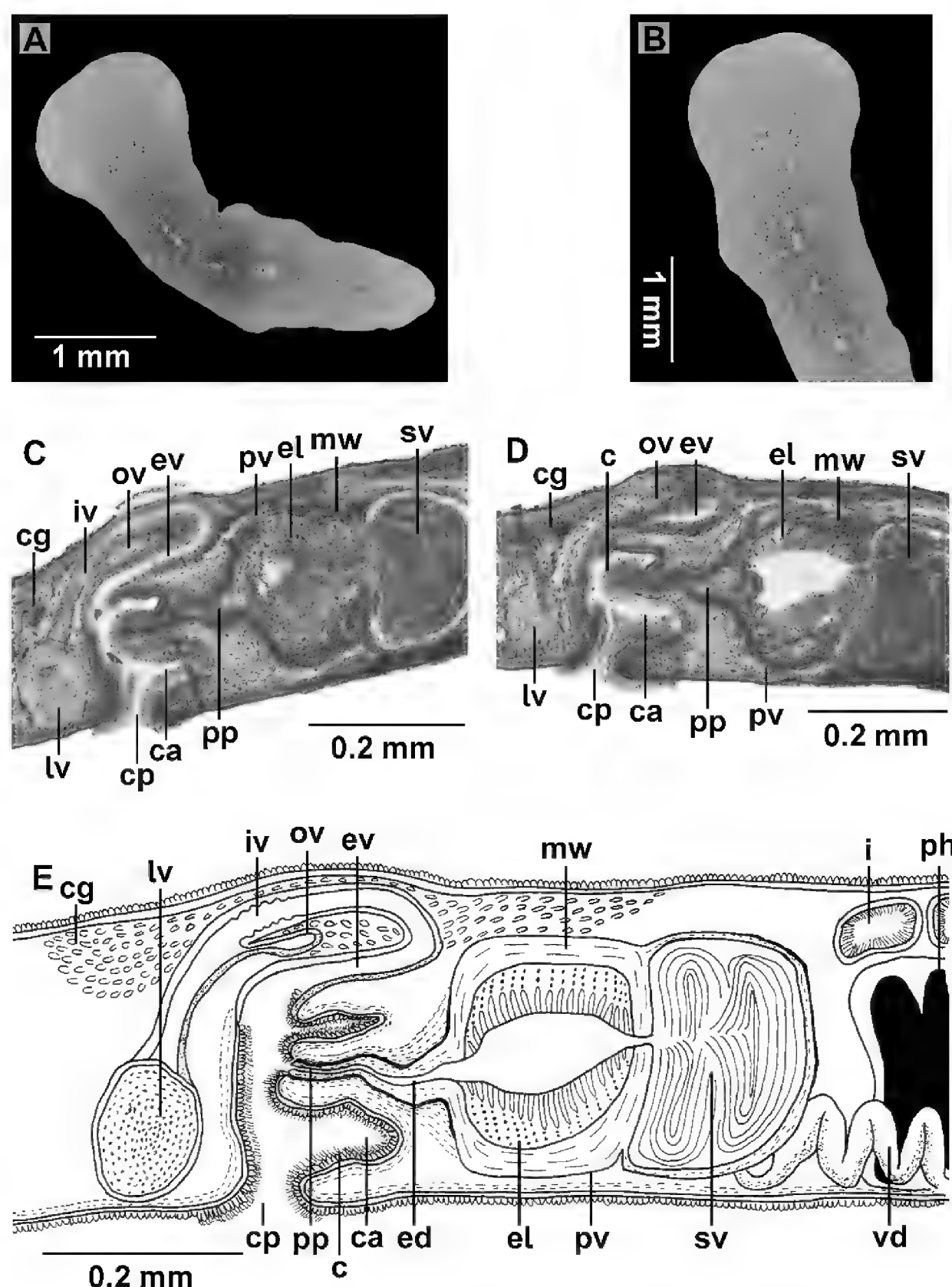


Figure 14. *Comoplana agilis* (MNCN 4.01/34634 to 3635). Histological sections are postero-anteriorly oriented: **A.** Dorsal view of the living specimen; **B.** Detail of the tentacles and eyes; **C, D.** Histological sections of the reproductive system; **E.** Sagittal reconstruction of the reproductive system. Abbreviations: c, cilia; ca, common atrium; cp, common pore; cg, cemental glands; ed, ejaculatory duct; el, epithelial lining; ev, external vagina; i, intestine; iv, internal vagina; lv, Lang's vesicle; mw, muscular wall; ov, oviduct; ph, pharynx; pp, penis papilla; pv, prostatic vesicle; sv, seminal vesicle; vd, vas deferens.

Genus *Phaenoplana* Faubel, 1983

Phaenoplana caetaria Pérez-García, Noreña & Cervera, 2018

Fig. 15

Material examined. Specimen found in the field, Station 16, 19 May 2015, 13 mm; specimen found in the field, Station 16, 19 May 2015, 21 mm; specimen found in the field, Station 17, 19 April 2015, 24 mm.

Type locality. Punta Carnero, Cádiz, Spain.

Description. Stylochoplanidae with elongated body, wider anteriorly, and folded within the margins. Length between 24 mm and 13 mm (19.3 ± 5.69). Colour of the dorsal surface light brown with yellowish spots (Fig. 15A, C). Ventral surface pale brown. Tentacles absent. Tentacular and cerebral eyes arranged in two clusters, with approximately 15 tentacular eyes and 27 cerebral

eyes in each cluster (Fig. 15B, D). Pharynx ruffled, positioned slightly anteriorly, between the first and second thirds of the body. Opening of the mouth in the last third of the pharynx. Genital pores separated. Male copulatory apparatus composed of a true seminal vesicle, an interpolated prostatic vesicle, and a penis papilla with a penis rod. Female complex consists of a well-developed external vagina (vagina bulbosa) and reduced Lang's vesicle (for more details, see Pérez-García et al. 2019).

Remarks. After the original description of *Phaenoplana caetaria* (Pérez-García et al., 2019), Oya and Kajihara (2019) described a new species of *Phaenoplana* from Japan (*P. kopepe*), increasing the number of species in this genus to six. In this context, *P. kopepe* is differentiated from *P. caetaria* by the presence of tentacles, a muscular bulb that surrounds the prostatic vesicle, the shaft of the penis, and the male atrium, a character that is missing in *P. caetaria*, which shows instead a very characteristic

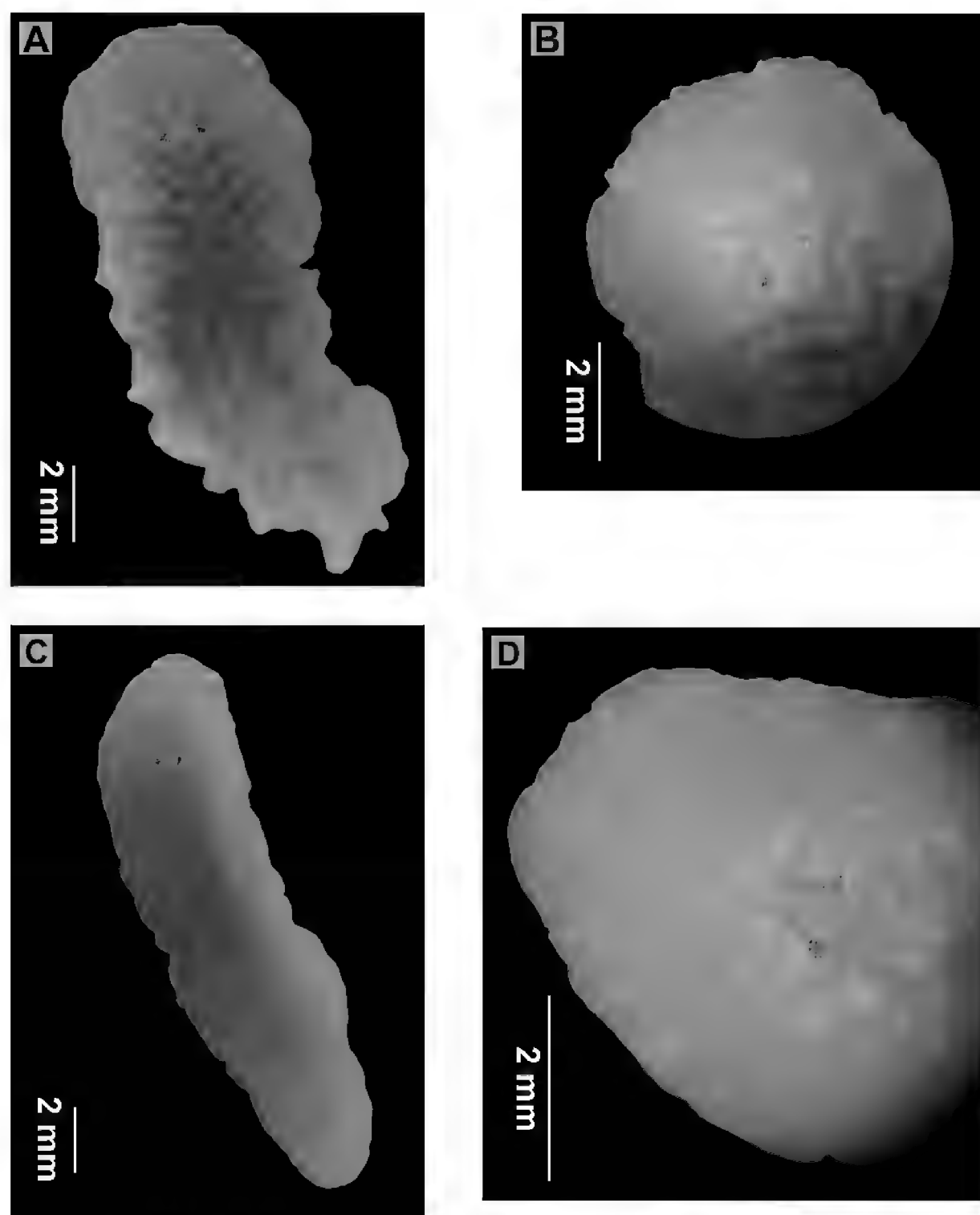


Figure 15. *Phaenoplana caetaria* (Two living specimens of Station 16): **A.** Dorsal view of specimen A; **B.** Detail of the eyes; **C.** Dorsal view of specimen B; **D.** Detail of the eyes.

twisted penis rod. Representatives of *Phaenoplana* have a predominantly Pacific distribution (5 known species) compared to the Mediterranean or Atlantic (two species), although the record of *P. caetaria* shows a clear expansion of the specific distribution of *Phaenoplana*.

Biology. This species is found under stones in the intertidal area of La Ballenera and Punta Carnero Beach, Cadiz, Spain.

Superfamily DISCOCELOIDEA Dittmann,
Cuadrado, Aguado, Noreña & Egger, 2019
Family DISCOCELIDAE Laidla, 1903
Genus *Discocelis* Ehrenberg, 1836

***Discocelis tigrina* (Blanchard, 1847) Lang, 1884**

Fig. 16

Polycelis tigrina Blanchard, 1847.

Leptoplana tigrina (Blanchard, 1847) Diesing, 1850.

Elasmodes tigrinus (Blanchard, 1847) Stimpson, 1857.

Material examined. • MNHNC MB16-000128, Station 4, 28 October 2018, 30 mm long; • MNHNC MB16-

000129, Station 5, 22 April 2019, 39 mm long; • MNHNC MB16-000130, Station 6, 5 May 2019, 34 mm long; • MNHNC MB16-000131, Station 8, 16 May 2018, 25 mm long; • MNHNC MB16-000132, Station 9, 15 May 2018, 12 mm long; • MNCN 4.01/4088, Station 10, 21 February 2019, 18 mm long; • MNCN 4.01/4089, Station 10, 21 February 2019, 20 mm long; • MNCN 4.01/4090, Station 11, 29 April 2014, 20 mm long; • MNCN 4.01/4091, Station 11, 9 October 2014, 16 mm long; • MNCN 4.01/4092, Station 11, 19 February 2015, 11 mm long.

Description. Living specimens between 11 mm and 39 mm in length (21.45 ± 9.51). Body shape oval, with rounded anterior and posterior ends. Dorsal surface smooth, light brown with many dark brown spots throughout the body, more concentrated in the main axis (Fig. 16A). Ventral face pale brown without spots (Fig. 16B). Without tentacles. Marginal, tentacular, and cerebral eyes present (Fig. 16C). Tentacular clusters with approximately 21 eyes each, and cerebral clusters with 32 eyes each. Pharynx ruffled, centrally positioned, and with deep pharyngeal folds. Oral pore opens at the end of the first third of the pharynx. Male and female systems open into a common genital atrium between the second and the last third of the body.

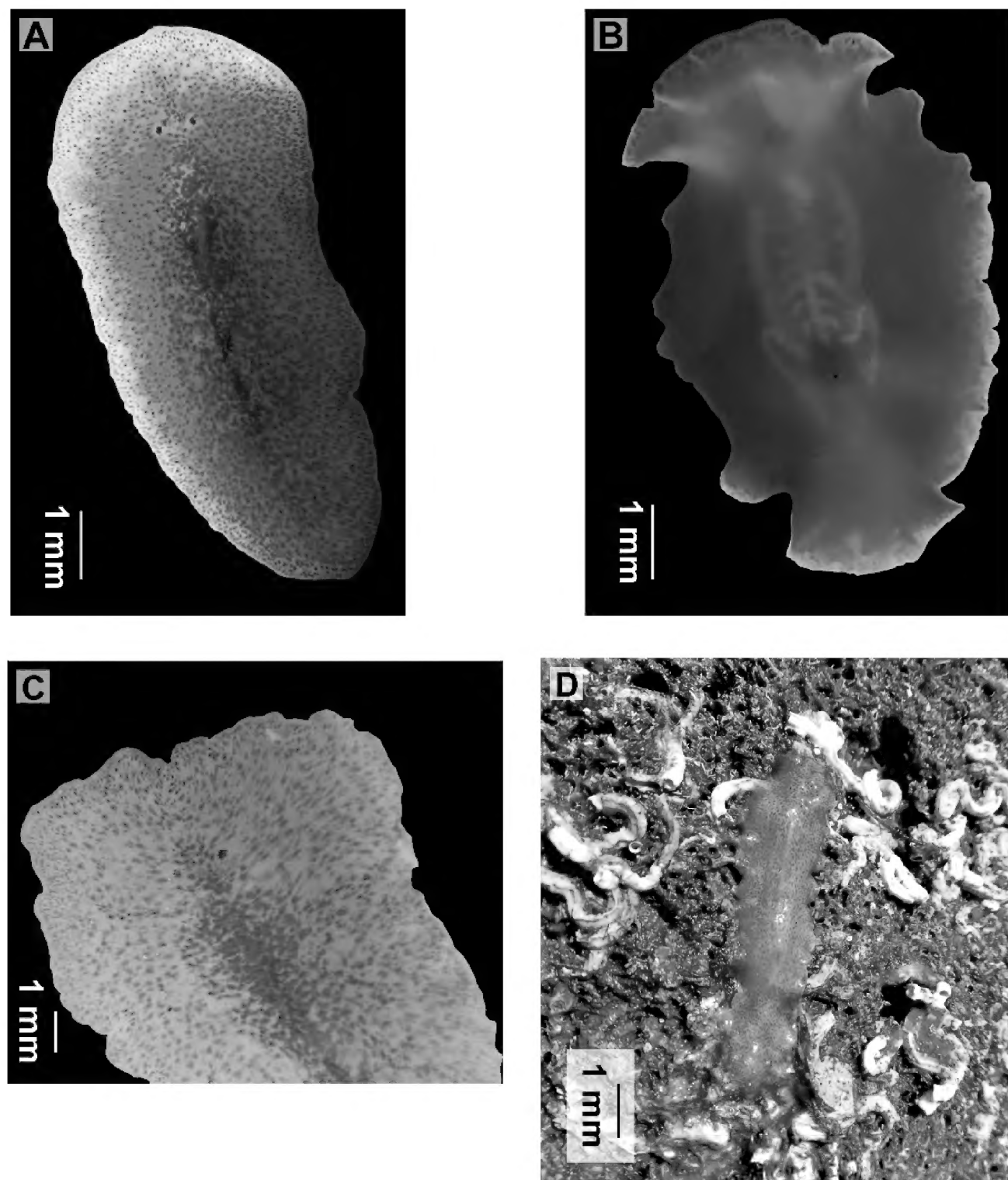


Figure 16. *Discocelis tigrina* (MNHNC MB16-000128): **A.** Dorsal view of the living specimen; **B.** Ventral view; **C.** Detail of the eyes (MNCN 4.01/4089); **D.** Example of the habitat where the specimens were found.

Remarks. The genus *Discocelis* comprises seven accepted species and is considered the genus with the largest number of species within the Discocelidae family. Three of these species exhibit a spotted dorsal pattern: *D. japonica* Yeri & Kabiraki, 1918, *D. pusilla* Kato, 1938, and *D. parvimaculata* Beveridge, 2000. These species are distributed on the Pacific coasts, whereas *D. tigrina* is considered an endemic species of the Mediterranean (Patzner et al. 2005).

Biology. Under stones, living on the rocky shore (Fig. 16D). Sometimes observed among brown algae, *Dictyota dichotoma* (Ochrophyta), and close to meadows of *Caulerpa prolifera* (Chlorophyta) (only in the Ria Formosa environment). It is known that this species frequently appears in association with bivalves (Gammoudi et al. 2017). Indeed, some of the specimens in our study were also found inside the empty shells of mussels. This finding is common within acotylean worms, as they are predators of a wide variety of molluscs (Galleni et al. 1980, Bahia 2016, Gutiérrez et al. 2023); hence, we could assume that this species feeds on them.

Distribution. This species has a wide distribution within the Mediterranean Sea and the Atlantic. The lo-

calities where *Discocelis tigrina* was reported are Sicily (Blanchard 1847); the Gulf of Naples (Lang 1884); the Peninsula de Rio de Oro, Western Sahara, and Port-Étienne; Mauritania (Palombi 1939); the coast of Catalonia (Novell 2001 Gammoudi and Tekaya 2012); the Canary Islands (De Vera et al. 2009; Cuadrado et al. 2017); Asturias (Marquina et al. 2014b); Galicia (Noreña et al. 2015); and Tunisia (Gammoudi and Tekaya 2012; Gammoudi et al. 2012; Gammoudi et al. 2017). This is the first record of this species in Portugal (Avenças, Arrabida, Troia, Lagos, and Faro) and Andalusia.

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